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THE SCHOOL YEAR 1939–40

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION extends its best wishes to the thousands of shop teachers who are about to reopen their classrooms to the students who are to take up their industrial-arts or vocational studies for the new school year.

It is to be hoped that both teachers and students will find much joy and benefit from their teacher-student relationships in the coming year. It is becoming more and more apparent that general education would not be complete without the offering which the shop teacher makes. It is apparent also that the question of what to teach and how to teach it is still confronting everyone engaged in the fields of industrial arts and vocational education. There is, therefore, still much to do and the ambitions will not fail to rise to the challenge.

To all then — "Good Luck."

IN THIS ISSUE

The school-opening number of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION presents a number of very timely articles to its readers. Outstanding among these are the *Course of Study Construction in Industrial Education* by Verne C. Fryklund and Earl L. Bedell, and the inspirational article on *Learning and Labor* by Dean M. Schweickhard.

All teachers of industrial arts and vocational education will find worth-while thoughts in Karch's *A Quiz Based on the Instructor;* Wood's *Exchange Units in Industrial Arts and Home Economics;* Groneman's *Teaching Materials for Industrial Education;* Ivy's *Industrial Arts in English Schools;* Roger's *Vocational Opportunities in Aviation;* Wallen's *Tool Tags that Save Time;* Wall's *Learning a Trade by Teaching It;* and Gray's *Practical Project Plan.*

For the woodworkers there are offered, Mathewson's *The Seasoning of Wood;* Bower's *Course of Study in Industrial-Arts Cabinetmaking — II;* Leonard's *Initial Book Ends;* Chadek's *Upholstered Chair;* Gottshall's *Flat-top Desk;* Tracy's *Drawing Board and T Square for Laying Out Slides;* Hick's *Jig for Turning Pole Ends;* Sowers' *Double Woodwork Bench;* and Well's *Sewing Box.*

Metalworkers will be interested in DeVette's *Fishing Reel;* Baxter's *Triple Candlestick;* Longley's *A Simple Cigarette Basket;* Conklin's *Forge;* Olson's *Pin or Ash Trays;* and Rose's *Tilt-Tripod Head.*

For the electricians there are Bivan's *Radio as a Part of Industrial Arts;* Northquest's *Soldering Iron;* Quaintance's *Making I.E.S. Sightsaving Lamps;* Taylor's *Oscillating Magnetic Engine;* and Roedl's *Electric Weather Vane.*

For the printers, besides Karch's article which has already been mentioned, there are the following articles: Wood's *The String Nuisance Tied Up* and Lampe's *Making Block Cuts of Your Ancestors.*

For the general shop, the homeshop and the industrial-arts club, there are: Belanger's *An Interesting Art and Craft Medium;* Hunt's *Pump Drill and Bow Drill,* and Hunter's *Kinks for the Home Craftsman.*

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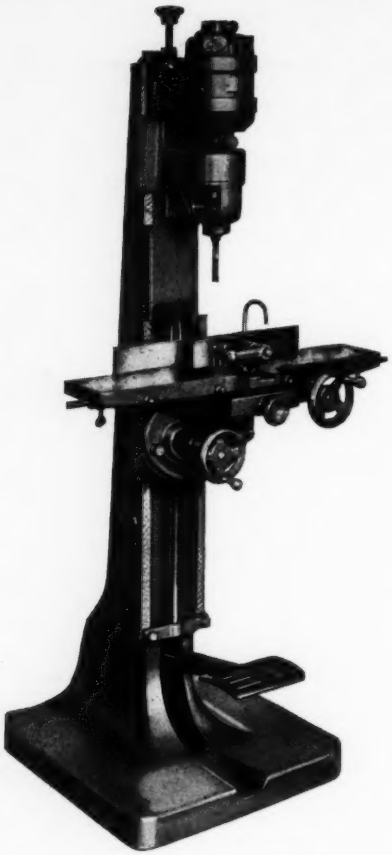
J-40 MORTISER



A plain table is regularly furnished with the J-40 Mortiser. It is accurately machined, has cross adjustment, and can be tilted 45 degrees to the right or left. However, at a small additional charge, it can be equipped with the compound table illustrated above. It is similar in construction to the plain table, but in addition has a lateral movement of 12" secured through a rack and pinion which is operated by a handwheel. Why not find out more about this machine? A letter will bring complete information. Mail it now to the

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

This is the ninth of a series of brief articles dealing with various woods, their properties and uses. It is our hope that they might make interesting and helpful classroom material. We will welcome your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

Little experience is required to produce mortises of excellent quality on this machine because it is so simple and easy to operate. With a surprisingly small amount of instruction your students can be taught to cut mortises that are straight, smooth and square, thereby adding immeasurably to the strength and appearance of the project in work. Operates equally well in hard or soft woods.

The machine itself is trim and clean in appearance . . . all operating parts are enclosed . . . one-piece, cast-iron base has heavy walls and few openings. The spindle is mounted directly on the motor, forming a compact unit which is lowered to the work on gibbed ways by means of a convenient foot pedal. Handwheels are provided for raising and lowering the table, and for cross adjustment.

A built-in blower fan operating on the spindle furnishes a powerful blast of air for removing chips from the work. The machine can be converted for use as a borer by removing two bolts which hold the chisel socket.

SHORT TALKS ON WOOD

WHITE ASH (*Fraxinus americana*)

Extreme toughness and elasticity make the wood of white ash most valuable. It also has excellent bending qualities, is easily worked, and does not shrink or swell abnormally. Heavy, hard and strong. Heartwood is light brown; sapwood is white.

It is used extensively for small tool handles, athletic equipment, agricultural implements, furniture and interior finishing. Also used in the manufacture of woodenware, boxes and crates, and for ship-building.

White ash is found from Nova Scotia to Minnesota to Florida and Texas. Grows to the best advantage in the rich, moist soil of mountain coves and river bottomlands.

It reaches an average height of 50 to 80 feet and a diameter of 2 to 3 feet. In timber it is tall and slender; alone, it develops an open oblong crown with drooping branches. One of the best ornamental trees because it grows rapidly, is easily transplanted, and is seldom attacked by disease.

The bark varies in color from a light gray to gray-brown. The rather narrow ridges are regularly separated by deep, diamond-shaped fissures. The leaves are compound, opposite, 8 to 12 inches long and have from 5 to 9 leaflets. The leaflets are sharp pointed, 3 to 5 inches long, dark green and smooth above, pale green underneath. The fruit is a winged, paddle-shaped seed, 1 to 2 inches long, which hangs in long, drooping clusters.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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Course of Study Construction in Industrial Education

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While the material contained in this article was originally intended specifically for the teachers in the Detroit schools, nevertheless, it contains fundamental principles which are applicable in any school system.

Course of study construction and revision offers intriguing problems to curriculum specialists, particularly in the procedures for weaving industrial subjects into the vast general education pattern. Curriculum committee members frequently are not in agreement as much as they might be concerning ways in which courses may be planned. Some measure of uniformity in understanding techniques of course building expedites the work of committees on curriculum problems. The techniques described in this article represent the procedure used in Detroit by committees in course construction and revision in industrial subjects.

A course of study should serve as a guide to teachers. With other offerings of the school the course of study should combine, under proper instructional conditions, to bring about desirable individual outcomes. All educational offerings include subjects in the curriculum and activities in the extracurriculum. These, in their total, are assumed to contribute to the education of the whole child — his mental, emotional, and physical growth. Industrial education shares in this service and, in so doing, it is an integral part of the general program of education. This is true for trade as well as for industrial-arts education.

A philosophy of education outlines in terms of principles, concepts, and beliefs, the purposes, aims, and general means of control for all the educational offerings of the schools. The aims of education determine for industrial education, as for other areas, the general outcomes to which society expects contribution. Therefore, in constructing a course of study in an industrial education activity, the aims of general education mark the starting point and, therefore, they should be given initial consideration. There should be contribution to the realization of the aims of education in the fullest measure made possible by the experiences named for a particular course.

Orientation

The first problem for consideration by a teacher or by a committee in building or revising a course of study would be one of orientation with the work at hand. Naturally, there must be clear understanding of the subject for which the course is intended, the grade level of the students, the types of students and their age range, the time limitation in terms of hours per day, times per week, the number of weeks allowed for the subject, equipment, and the supplies available. These are all variables that must be taken into account in construction as well as in the ultimate functioning of a course in the various schools. Initial understanding of these points limits the scope and clarifies the problem. A common understanding of procedures in course construction further clarifies the work of those who are concerned with course construction. After orientation with the problem there follows a sequence of steps in building or revising the course. The next step would be consideration of aims.

Determining Aims

The various aims of education, in their similarities, were conceived for all the schools and with no particular reference to subject-matter areas or subjects. The aims of all education are general in nature. They are assumed to mark the end toward which all formal education moves. Being broad in scope, they allow for the latitude of the full educational program. More specific working aims are necessary to mark the ends of action for particular courses of study. Inasmuch as society, through its stated principles and aims of education, only indicates the expected general outcome in terms of general aims, it seems logical that any subject aims should be conceived in terms of specific aims that will contribute to the realization of the general aims. There are three suggested steps in formulating subject aims in order that they will mark the end toward which instruction in a particular subject should move, and so that such instruction would make its fullest measure of contribution to the aims of general education.

1. A set of aims for general education should be agreed upon and stated, and their principles should be studied by all who are concerned with the problem of course building or revision.

2. A set of aims for the subject-matter area, or field (such as the field of industrial education) should be conceived by analyzing the general aims and making new ones to determine the emphasis of the field contribution. This set of aims is not assumed to be conceived for any particular subject, but marks the end toward which instruction moves in all the subjects of the field. These aims would be narrower than are those for all education, but too broad for use as subject aims.

3. A set of aims for the subject should be conceived by analyzing the aims of the subject-matter field and by making new ones to determine the fullest contribution that could be made by instruction in the subject. These aims should definitely be stated and they should serve as the working aims for building the course of study. Contribution to the realization of these aims are contributions to the realizations of the aims of general education.

The aims of the subject should be stated in terms of the *ideals, attitudes, appreciations,* and *skills* that learners should possess upon completion of the course. In industrial education these qualities limit the aims; they specify the outcomes. This limitation functions (1) according to the individual differences of the learners, and (2) according to the emphasis of the work; whether it is for general educational purposes or for trade purposes.

Functions of Aims: The aims of a subject have several important functions. *First,* they harmonize the work in a subject with the aims of general education. *Second,* they indicate the end toward which instruction in the subject should move. They help the teacher to determine the proper direction and to keep instruction within bounds. *Third,* they help the teacher to determine when the desired end of instruction in the subject is reached. *Fourth,* they serve as a guide in determining what content shall be chosen, which, when accompanied by good instruction, will make the best contribution to realization of the aims. Any content that would not contribute to the desired end should be rejected. It is difficult to know what content to accept or reject unless aims are definitely stated. *Fifth,* the aims of a subject are necessary in order to determine what methods of instruction should be employed in order to present the content. Proper instructional emphasis in terms of desired ideals, attitudes, appreciations, and skills would be difficult without subject aims. *Sixth,* they indicate the nature of the appraisal procedures that should be employed in evaluating outcomes. They are of help in setting up objectives for constructing examinations and for evaluating results. Tests are important for determining when the aims have been attained.

Selection of Contents

Once the subject aims have been selected, a natural next step would be the selection of content. Content is selected from the analysis of the trade or industrial-arts activity in question. Analysis is an inventory procedure that can be undertaken at any time prior to or simultaneously with course construction. It serves as a check to assure thoroughness and completeness. In industrial education the content is expressed in terms of fundamentals (1) that the learner must know, and (2) that the learner must be able to do, and (3) suitable type projects or jobs in which the fundamentals would be applied. The jobs must be carefully studied in terms of use value, design, and pupil interest. Drawings and specifications for the jobs are necessary.

Methods of Instruction

A logical next major step in constructing the course of study would be a consideration of the teaching techniques and devices that would enable the teacher to teach the fundamentals effectively so they will best contribute to the aims of the subject.

Method is relative. It would be difficult to state exactly what method or combination of techniques would be most effective in a particular teaching situation because of the problem of individual differences in learners and teachers. However, there are a few commonly used methods in shop instruction that, at one time or another, have been useful in the daily instructional procedures of most shop teachers. Perhaps it can be said that they are more likely to serve in combination than in singular form. These methods are: Demonstration, lecture, lecture-demonstration, written instruction, discussion, observation, trial and error.

There is need always for various devices and aids that would help to facilitate instruction. The resourceful teacher, in attempting to cope with individual differences, would be ready to use any or all of the following suggested aids and devices: textbooks, workbooks, motion pictures, lantern slides, working drawings, sketches, models, job sheets, operation sheets, assignment sheets, information sheets, pictures, patterns, charts and diagrams, plant visits, catalogs, visiting speakers, oral and written reports, examinations, references, blackboards, personnel organization.

Consideration of methods of teaching must follow selection of content in planning a course of study. However, it is usually desirable to have a discussion of methods appear before the content when the course appears in printed form. The content is likely to be lengthy and detailed in industrial education; therefore, if consideration of methods is covered in sequence after the content, the statements of methods may not be given the reading that they would receive if they appeared before the content.

Attainment of desired outcomes, through attainment of aims, is limited in part by the method of teaching. In one kind of school, or at certain higher grade levels, skills may be desired outcomes as a result of instruction in certain learning units. In another school, or at lower grade levels, appreciation, rather than skills, would be among the desired outcomes. Methods of teaching, therefore, rather than the list of learning units, would control the emphasis.

It goes without saying that while the content may be well chosen, the aims may not be reached because of misunderstanding of desired outcomes and failure in the methods of teaching. Moreover, the nature of content and its organization would have much to do with the choosing of effective instructional procedures and devices.

A teacher's working knowledge of the principles of psychology would be necessary as a guide in method, in order that the best practices of instructional procedure would be followed. Among others, an example of such need appears in consideration of the problem of coping with individual differences in learning.

Testing and Evaluation of Results

Results of instruction should be determined by objective means as well as by teacher and pupil subjective evaluation. That is, there should be measurement which is of such nature that individuals who understand the work can agree upon the results. One of the best ways of knowing that the aims have been reached, and that there has been proper emphasis to attain desired outcomes, is through use of tests.

Any tests used to evaluate results, should be constructed according to the aims of the course. If the aims of the course are conceived in terms of ideals, attitudes, appreciations, and skills, then the tests should measure these qualities according to the desired emphasis. For example, in industrial arts below the high-school level, appreciation is assumed to be of greater importance than skill; therefore, it hardly seems necessary to measure manipulative skills beyond that appraised through the teacher's observation, which appraisal should be in terms of individual differences because there usually are pupils at every school level who should be permitted and encouraged to develop manipulative skill. Adequate judgment of such skills can, for practical purposes, be determined by observation.

Evaluation of results does not assume formal testing only. Appraisal by informal evaluation procedures of shopwork and knowledge is exceedingly valuable. Frequent informal written and oral questions of appraisal are desirable in addition to a formal plan of testing.

In shopwork, as in other areas of education, there are direct and indirect outcomes. The indirect outcomes, or concomitants, are not readily measurable. The concomitants are the learnings that take place rather incidentally. They are considered by many teachers, even though hardly measurable to be fully as important as are the direct learnings specified by the aims and content. The teacher, his organization of content, and his methods influence the value of concomitant learning to a high degree.

In industrial arts, the informational outcomes are more easily measurable by paper tests than are manipulative skills. However, application of certain mental skills also can be measured by paper tests. Samples of typical objective types of test elements and plans for testing should appear in a course of study. They would best be placed in the appendix.

Texts and Reference Materials

It would seem necessary, in constructing a course of study, to include a list of texts and reference materials. Such a list, in a printed report, logically follows rather than precedes the presentation of the course, in the same way that a bibliography follows the discourse in any scientific reporting. Therefore, books and materials used in course construction, and books and materials of value in teaching, should be

listed separately in the appendix. A course of study is exceedingly valuable to a teacher when it is accompanied by a bibliography.

Supplementary Services and Materials

The appendix should include a list of materials such as sample tests, bibliographies, suggested plans of shop organization, shop layouts, lists of available supplies, equipment, directions for requisitioning supplies, safety regulations, lists of extracurricular organizations such as the Boy Scouts and craft clubs, drawings of projects, suggested plans for grading and recording, sample instruction sheets, and a glossary. It may not be necessary and desirable to include all of these in every course of study, but when they are included they should be there because they are assumed to be useful to the full functioning of the course. It should be understood that there are many things seemingly outside of the course of study itself that have considerable influence on the direct and indirect learning desired of the pupils in consequence of daily instruction. Inasmuch as supplementary materials do not readily fall into the sequence of presentation of a course of study, they are best included in the appendix.

Learning and Labor

Dean M. Schweickhard

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A Seeming Paradox

Association of ideas or things with one another appears to be a powerful influence for good or ill, for advancement or retardation in human thinking and experience. Wherever there has come to exist the consciousness of an association between labor and learning it has been all too commonly of a negative nature, bearing the impression that learning has little in common with labor, and that the interests of the two are divergent.

As a matter of fact the quest for an education has been too frequently an obvious attempt on the part of the individual to find a way in life wherein he might escape the demands of labor, especially in its physical form. The many efforts to divorce the manual aspects of schoolwork from those considered more purely intellectual, have indicated that even in the minds of some school people, any friendly relationship between learning and labor loomed up as some sort of a paradox.

Experience the Best Teacher

The greatest thinkers of all ages, and the foremost of the educational leaders of our time, have been able to find a quality in labor which is indispensable to effective learning. It has been established as a truism, through countless repetition, that "experience is the best teacher." This, of course, means the right kind of experience, and suggests that it may be conditioned or guided by those who have previously had experience of a similar nature.

Here again we get a glimpse of an inextricable relationship, in the application of what has been learned in the past, through experience, to a new enterprise involving a laborious undertaking. The old adage simply means that we learn most effectively and most perfectly by *doing*, rather than by watching someone else do, or by reading about what someone else has done.

If there is one advance in modern education which stands out ahead of others it is the straightforward recognition of this simple, but vitally fundamental, relationship. Also we seem to have reached the point where we are willing to admit that: (1) There is something more demoralizing about seeking to avoid work than there could possibly be about the work itself; (2) there is an essential difference between the inactivity of resting after conscientious labor, and that induced by laziness; (3) there are differences of feeling and effect upon the individual between enforced labor, and work of one's choice which demands as much or more physical exertion; (4) learning acquired through labor is more greatly prized; (5) a proper balance between mental and physical activity takes one a long way on the road to health and happiness.

Laborsaving Devices

The value of experience as a teacher is based upon an innate principle which is partly physiological and partly psychological; namely, the formation of habit. Habit formed as a result of repeated experience may be looked upon as nature's own fundamental laborsaving device. Primarily by means of this device, man has learned to perform, with the expenditure of a minimum of physical energy, the tasks which have become his through choice or necessity.

Not satisfied with that degree of relief from drudgery, man found that he could expend still less energy on his own part if he transferred his burdens to the backs of animals, and even pressed his fellow beings into service for himself. Still possessed with the desire for an easier way he turned his inventive genius to devising mechanical means for accomplishing the same ends. Thus we may observe the whole line from the simple lever and the wheel to the multitudinous array of mechanical devices for all purposes which are in existence today.

Like many other quests undertaken by man, prompted by legitimate urges and aimed toward justifiable ends, this constant quest for more highly perfected laborsaving devices has failed to accomplish the purposes for which it was begun, and in numerous instances has passed the point where benefits have turned into disadvantages. The remedy suggested by some would be found in scrapping the machines, and attempting once more to do by hand those tasks which are now done more quickly and more perfectly by mechanical means.

Excellent material for the shop teacher to embody in his general talks to his students.

In order to intelligently consider the wisdom of such a move we must stop a moment and ask ourselves a few questions, for example: What has prompted businessmen to install machines in their offices for bookkeeping, calculating, and taking dictation? How many people could enjoy the service, convenience, and pleasure of the automobile, the railroad, and the airplane, if it were not for the mechanical accomplishments behind them, and the machine methods by which they are produced? How would the situation in your home be affected if you were to remove every piece of mechanical equipment and every laborsaving device?

Obviously such a move could not be made, if we are to remain in the realm of reasonable procedure. Beyond the shadow of a doubt the perfection of mechanical invention carries a myriad of benefits for mankind, if they can be sifted from the accompanying potential evils. The sum of all the detrimental effects of the era of mechanization may be comprehended by saying that it has pulled the human race apart.

Unity the Way to Progress

The way to bring the interests of mankind together again lies within the hands of those concerned with education. The chief grievance against the machine today is that it has thrown men out of jobs, and in a civilized world the job still stands for

the way to a livelihood. Even deeper than the job there are some satisfactions which must be preserved. It is not the labor itself which a man performs but the fruit of his labors that brings ultimate satisfaction; so whether he labors by hand or machine or by mind alone, he must have some feeling of accomplishment.

Too great a utilization or control of the machine itself brings a false impression of personal power. Thinking, machine operation, and hand labor are brought into such close association in the school shop that each of necessity tempers the others. In such an atmosphere boys throughout the land are learning that no permanent value is derived from seeking the easy way out and letting the other fellow carry the burden. Also, that the satisfaction derived from a sense of personal security is short lived if it is procured at the expense of the security of others.

Ultimate progress will be made as rapidly and extensively as the fundamental interests of persons in the various walks of life become unified. The process will be hastened in the degree to which every person who performs manual labor comes to have greater respect for the accomplishments of the scholar. It will be clarified by the more widespread opportunity to work, but under conditions where every working person has enough leisure time and reserve energy to enjoy the things which uplift the mind and soul.

The unification of the interests of learning and labor will become most nearly consummated when every educated man puts more completely into practice the things which he knows, and retains a more active interest in the affairs of the man who works with his hands. In such a time every person, regardless of the amount, extent, or kind of education he possesses, shall be willing to work and struggle — physically if necessary — to meet the problems of life in a high-minded and courageous way.

A Quiz Based on the Instructor

R. Randolph Karch

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Department of Publishing and Printing,
Rochester Athenaeum and Mechanics Institute,
Rochester, New York

Let's turn the tables on the instructor — let's see how *he* rates with his students!

Instructors often wonder what their students really think of them. They wonder because they are seldom told. They are seldom told because students are, on the most part, inarticulate in the face of possible disciplinary measures. These measures may be entirely in the mind of the students, but they are there just the same.

Now one may ask why in the world instructors should know what their students think. "Their's not to wonder why; their's but to do — or die." One may feel so secure in his high type of pedagogy that such a thing would be silly and quite unnecessary. Again, he may be laboring under a misapprehension. But perhaps the "consumer," if you please, really has some good, constructive criticism of his teacher that the latter does not know exists. The problem is to get these opinions from reticent students. Some instructors can learn a few things from students, after all!

Believing the above statements to be self-evident, a few of the teachers in the writer's school gave the "quiz" appearing in this article to their students. The results were interesting — and quite enlightening!

Great pains were taken to see that each student understood the rules involved, as appearing under the heading of the "quiz." This was necessary so that each student would enter into the spirit of the idea. The best procedure, it is believed, would necessitate the students placing the test sheets on a rear desk of the room, and asking the last student who completes the work to look over all papers to make sure that no names or other identifying marks appear on them, and then to shuffle the papers well. This lets the students know there is no *catch* to the idea.

Score sheets on the teacher give him a fairly good picture of how he stands with his class. Naturally, it is still "student opinion," which may or may not be good criterion. Of course, one must discount the paper or two from the "wise guy" in the class, who will take this opportunity to "get back at" his teacher. On the whole, however, the results should be fair and impartial.

To save using up the test pages, it is better to have printed or mimeographed sheets prepared in which students merely check their "answers" after the question numbers.

Try it sometime!

The Quiz

Do not sign your name. This is a quiz about your instructor. Select the answer which best suits your opinion of the teacher in handling the class and write the letter on the test sheet in the space provided. Try to be fair, even if you think the teacher is not. Do not sign your name to this paper. Leave this paper at the door when you leave. The teacher gives his word that he will not attempt to trace any answers back to individual students.

.... 1. In your teaching methods, you are: (*a*) Ultramodern, (*b*) modern, (*c*) average, (*d*) old fashioned, (*e*) very old fashioned.

.... 2. In knowledge of your subject matter, you: (*a*) "Know your suff," (*b*) seem to know most of the material, (*c*) just average, (*d*) know little about it, (*e*) know very little about it.

.... 3. In assignments, you are: (*a*) Very clear, (*b*) clear, (*c*) just average, (*d*) vague, (*e*) very vague.

.... 4. In class discussion, you: (*a*) Invite and encourage class participation, (*b*) are indifferent to class participation, (*c*) allow class discussion, (*d*) do all the talking, (*e*) "squelch" any student who tries to take part.

.... 5. In your grading of work, you: (*a*) Are too liberal, (*b*) are reasonably liberal, (*c*) are an average marker, (*d*) are a hard marker, (*e*) are downright unfair.

.... 6. In conducting the class, you: (*a*) Are patient when questions are asked, and answer them, (*b*) are ready to answer them, (*c*) put off the questioner, (*d*) often embarrass students when they ask questions, (*e*) insult students when they ask questions.

.... 7. Your personality: (*a*) Is very pleasing, (*b*) is pleasing, (*c*) is just average, (*d*) is not very pleasing, (*e*) is hateful.

.... 8. In your class discipline, you: (*a*) Act like a dictator, (*b*) allow little freedom in class, (*c*) allow some freedom, but are strict when you need to be, (*d*) let students do as they please some of the time, (*e*) allow the students to do as they please all of the time.

.... 9. In your class periods, you are: (*a*) Never late to class, (*b*) seldom late to class, (*c*) late to class some of the time, (*d*) often late to class, (*e*) late most of the time.

....10. In your general attitude, you are: (*a*) Likable and friendly all of the time, (*b*) likable and friendly some of the time, (*c*) often moody; have peaks and valleys in disposition, (*d*) often hateful, (*e*) always hateful.

....11. In your preparation of class material, you: (*a*) Have it well planned way ahead, (*b*) have things planned on time, (*c*) now and then come to class with no lesson material, (*d*) often come to class with little preparation, (*e*) come to class seeming to have nothing planned most of the time.

....12. In your speech, you: (*a*) Use simple,

"Oh, wad some power the giftie gie us,
To see oursels as others see us!"

— Robert Burns

---

everyday, and understandable language, (*b*) are prone to use big words which are sometimes hard to understand, (*c*) usually use big words which are hard to understand, (*d*) always talk over the heads of those in the class.

....13. In class lectures, you: (*a*) Talk clearly and concisely (not wasting words), (*b*) repeat when necessary to make a matter more plain, (*c*) repeat when unnecessary, (*d*) get off the subject matter frequently, (*e*) talk much but really say little.

....14. In personal appearance, you: (*a*) Are flawless, (*b*) are neater than the average, (*c*) show reasonable care, (*d*) are careless, (*e*) are sloppy.

....15. Your manner in the classroom is: (*a*) Altogether too dignified, (*b*) reserved and dignified, (*c*) reasonably formal, (*d*) informal, (*e*) too informal.

....16. In putting across a difficult point, you: (*a*) Are very successful, (*b*) are better than average, (*c*) are reasonably clear, (*d*) fail occasionally, (*e*) make the matter hard to understand.

....17. In this course, quizzes are given: (*a*) Too often, (*b*) more often than usual, (*c*) in average amount, (*d*) less often than usual, (*e*) never.

....18. In this course, the amount of work required of one is: (*a*) Too much, (*b*) more than average, (*c*) average, (*d*) less than average, (*e*) much less than average.

....19. In this course, the text material is: (*a*) Very good, (*b*) good, (*c*) average, (*d*) less than average, (*e*) inadequate.

....20. In leading the class, you: (*a*) Are very confident, (*b*) are confident, (*c*) seem reasonably sure of yourself, (*d*) seem to need more confidence in yourself, (*e*) seem to be afraid.

....21. In regard to a sense of humor, you have: (*a*) An excellent one, (*b*) above-average rating, (*c*) an average rating, (*d*) below-average rating, (*e*) none.

....22. What new courses or parts of courses should be added?

.....

....23. What courses or parts of courses seem unnecessary and might be eliminated?

.....

....24. What courses have too much time devoted to them?

.....

....25. What courses have too little time devoted to them?

.....

....26. List the courses which interest you, the most preferred one on top.

.....

....27. What courses interest you the least?

.....

....28. What courses have too much outside preparation?

.....

....29. What help could be gained from weekly group conferences?

.....

....30. What laboratory regulations should be changed?

.....

The Seasoning of Wood

J. S. Mathewson

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U. S. Department of Agriculture

Excellent technical, related-subjects material for the woodworking class.

Wood in the living tree differs from wood ready for use principally in that it has an excess of moisture beyond the amount that can be tolerated in most of the commodities and structures made of wood. The excessive moisture must be removed (1) to reduce shipping costs, (2) to obviate the dangers of shrinkage, checking, honeycombing, and warping in service, (3) to remove conditions favorable to blue stain, decay, and some forms of insect attack, (4) to increase strength, and (5) to improve capacity for taking treatment with preservatives. This moisture removal is accomplished either by air seasoning or by kiln drying. Since an understanding of the behavior of wood with respect to moisture is essential to the proper care of lumber in storage, in fabrication, and in service, it may be well to examine the wood-moisture relationship in some detail.

Moisture Relations of Wood

The sap in green wood is chiefly water. Although this material contains small amounts of soluble organic and mineral substances, for most purposes of practical drying the problem is that of removing water from the wood.

Moisture in green or wet wood is held in two ways. It is contained in the hollow centers or lumens of the spindlelike individual fibers or cells, and it is absorbed by the walls of these fibers. The liquid in the cavities is known as "free" water; that in the cell walls as "imbibed" water.

Some free water is present in both the heartwood and the sapwood of most living trees, but the amounts differ greatly in many cases. Sapwood usually contains the greater amount of moisture. Butt logs usually have a higher moisture content than top logs. Contrary to popular opinion, the variation during the year in the amount of moisture or sap in green wood is slight. Species and place of growth, however, do influence the moisture in the living tree substantially, the moisture content of green wood varying from 30 to 300 per cent.

The percentages just expressed are based on the oven-dry weight as is customary. For example, if the moisture content of a piece is said to be 50 per cent, there are by weight 50 parts of water to 100 parts of oven-dry wood. The usual method of accurately determining moisture content is to cut a sample, and to weigh it accurately before and after oven drying at 221 deg.

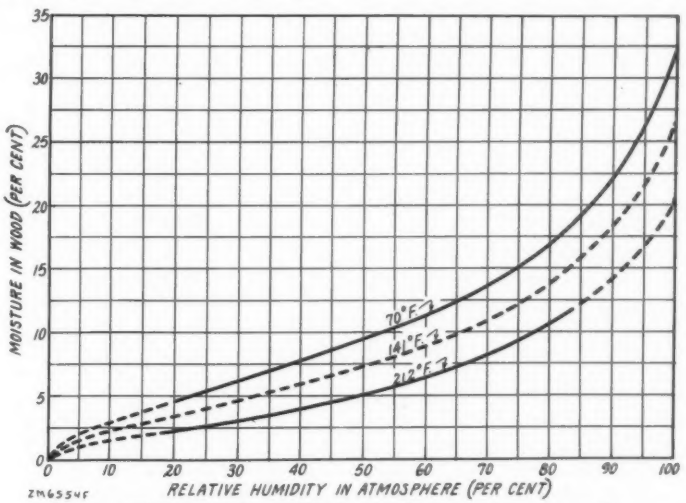

Fig. 1. Relation of the equilibrium moisture content of wood to the relative humidity of the surrounding atmosphere at three different temperatures

[1]Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

F. until it ceases to lose weight. The difference between the two weights is divided by the oven-dry weight (the second weight obtained) and the quotient is multiplied

Temperature Deg. F.	Weight of moisture at saturation Grains per cu.ft.
20	1.2
40	2.9
60	5.8
80	11.1
100	20.0

Table I. Moisture capacity of air at different temperatures at normal atmospheric pressure

by 100. Thus if the initial weight is 80 grams and the oven-dry weight is 50 grams the moisture content is

$$\frac{80 - 50}{50} \times 100 = 60 \text{ per cent.}$$

Like other moisture-holding materials, wood takes on or gives off moisture in the attempt to come to a state of balance with the surrounding atmosphere. This balanced moisture content is known as the "equilibrium moisture content." Figure 1 shows the relationship between the equilibrium moisture content of wood and the relative humidity of the atmosphere at three different temperatures. To illustrate the use of the diagram, by reading from the intersection of the 80 per cent relative humidity line with the 70 deg. F. curve, it can be determined that wood in an atmosphere at this temperature and relative humidity tends to reach a moisture content of about 17 per cent. The information in the diagram shown in Figure 1 is so basic to an understanding of wood seasoning and care that it may be worth while to examine the meaning of one of its terms — relative humidity.

Air containing the total quantity of water vapor that it can hold at a given temperature is saturated. The ability of air to dry wood or any other substance varies with the amount of additional moisture it can take on before becoming saturated. The quantity of vapor actually in the air, expressed as a percentage of the quantity that it would hold at saturation, is called its "relative humidity." The relative humidities of two equal quantities of air at the same temperature indicate their comparative drying capacities. Low humidities represent dry air and high humidities moist air.

Referring to Table I, 1.2 grains of moisture will saturate a cubic foot of air at 20 deg. F.; the relative humidity is then 100 per cent. If the air and its moisture are raised to a temperature of 80 deg., however, its relative humidity will decrease from 100 per cent to 11.1 per cent, as shown by the definition of relative humidity and the following computation:

Use of lumber	Moisture content (per centage of weight of oven-dry wood) for:					
	Dry Southwestern States		Damp Southern coastal States		Remainder of the United States	
	Average* Per cent	Individual pieces Per cent	Average* Per cent	Individual pieces Per cent	Average* Per cent	Individual pieces Per cent
Interior finish woodwork and softwood flooring	6	4-9	11	8-13	8	5-10
Hardwood flooring	6	5-8	10	9-12	7	6-9
Siding, exterior trim, sheathing and framing**	9	7-12	12	9-14	12	9-14

* In general the moisture-content averages have less significance than the range in moisture-content permitted in individual pieces. If the moisture-content values of all the pieces in a lot fall within the prescribed range, the entire lot will be satisfactory as to moisture-content no matter what its average moisture-content may be.

** Framing lumber of higher moisture-content is commonly used in ordinary construction because material of the moisture-content specified may not be available except on special order.

Table II. Recommended moisture-content for various wood items at time of installation

	Species of wood; common and botanical names	Shrinkage (measured values)			Ratio of tangential to radial shrinkage
		Volumetric Per cent	Radial Per cent	Tangential Per cent	
HARDWOODS	Ash, white (Fraxinus americana)	13.3	4.9	7.9	1.61
	Basswood (Tilia glabra)	15.8	6.6	9.3	1.41
	Beech (Fagus grandifolia)	16.3	5.1	11.0	2.16
	Birch, yellow (Betula lutea)	16.7	7.2	9.2	1.28
	Elm, American (Ulmus americana)	14.6	4.2	9.5	2.26
	Gum, red (Liquidambar styraciflua)	15.0	5.2	9.9	1.90
	Hickory, bigleaf shagbark (Hicoria laciniosa)	19.2	7.6	12.6	1.66
	Maple, sugar (Acer saccharum)	14.9	4.9	9.5	1.94
	Oak, red (Quercus borealis)	13.5	4.0	8.2	2.05
	Oak, white (Quercus alba)	15.8	5.3	9.0	1.70
	Poplar, yellow (Liriodendron tulipifera)	12.3	4.0	7.1	1.78
	Walnut, black (Juglans nigra)	11.3	5.2	7.1	1.37
CONIFERS	Cedar, western red (Thuja plicata)	7.7	2.4	5.0	2.08
	Cypress, southern (Taxodium distichum)	10.5	3.8	6.2	1.63
	Douglas fir (Pseudotsuga taxifolia) (Coast type)	11.8	5.0	7.8	1.56
	Pine, longleaf (Pinus palustris)	12.3	5.3	7.5	1.42
	Pine, northern white (Pinus strobus)	8.2	2.3	6.0	2.61
	Pine, shortleaf (Pinus echinata)	12.6	5.1	8.2	1.61
	Pine, western white (Pinus monticola)	11.8	4.1	7.4	1.81
	Redwood (Sequoia sempervirens)	6.8	2.6	4.4	1.56
	Spruce, Sitka (Picea stichensis)	11.5	4.3	7.5	1.74

Table III. Average shrinkage of woods grown in the United States during drying from the green to the oven-dry condition, expressed in percentage of the green dimension. Radial and tangenital shrinkage values are based on width measurements of small clear pieces 1 inch thick, 4 inches wide, and 1 inch along the grain; volumetric values are based on pieces 2 by 2 inches in cross secton and 6 inches long

$$\frac{1.2 \text{ grains}}{11.1 \text{ grains}} \times 100 = 11 \text{ per cent (neglecting the expansion of the air).}$$

At 100 per cent relative humidity, air cannot dry wood because it can hold no more moisture. At 11 per cent, on the other hand, it may dry wood entirely too rapidly. At 60 deg., the same air, with a relative humidity of about 21 per cent, perhaps would still dry wood faster than is desirable. During the summer the relative humidities at representative, but not extreme, points in the United States are usually between 40 and 80 per cent.

Assuming constant temperature and constant circulation of air, the drying of a given piece of wood depends upon the humidity of the atmosphere surrounding it, although it is also true that the higher the moisture content of the wood the faster it

will lose moisture under given conditions. Wood is practically always undergoing at least slight changes in moisture content because of its tendency to accommodate itself to both daily and seasonal changes in atmospheric humidity. This accounts for the variations in the moisture content of thoroughly air-dry wood at different times of the year.

One of the conditions that makes moisture changes in wood of the greatest practical significance, is the shrinkage of wood with a loss of moisture, and the converse, swelling with moisture gain. Some loss of moisture, however, is not accompanied by dimension changes. Loss of the free water from the cell cavities, previously referred to, is not accompanied by shrinkage. Consequently, the condition in which the cell cavities are empty, with the cell walls still saturated is a most important one in drying, for it is with the loss of water from the cell walls that shrinkage begins. For most species this condition occurs when the wood is at a moisture content of 25 to 30 per cent.

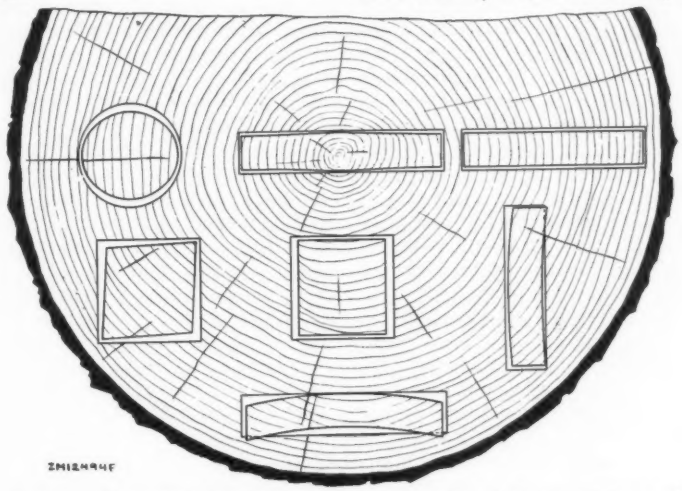

Fig. 2 — Characteristic shrinkage and distortion of flats, squares and rounds, as affected by directon of the annual rings. Tangential shrinkage is about twice as great as radial

In actual practice, of course, the cells near the surface of a piece of wood dry below the fiber-saturation point before those of the interior reach it. Then, even though the average moisture content of the whole piece may be above the fiber-saturation point, the outer portion tends to shrink, while the interior does not; in fact, the interior resists the shrinkage pressure of the outer portion. Such a condition is a common cause of serious drying troubles and is aggravated by extremely high temperatures, low humidities, and high rates of circulation.

The fact that wood below the fiber-saturation point shrinks and swells with changes in moisture content makes it highly desirable, in the seasoning process, to bring the wood to a moisture content that will be suited to the conditions under which it will ultimately be used. The necessity for attention to this phase of drying is becoming increasingly apparent. Table II gives recommended moisture-content values for various wood items at time of installation. The values shown may be of interest to those responsible for the storing and fabricating of wood as well as to wood-seasoning operators and to builders. Although the shrinkage of wood commodities indoors may not be so serious as damage to dwellings due to moisture and dimensional changes in structural members, the maintenance of shape, and the durability of glue joints call for equal care in fabricating wood articles at a suitable moisture content.

Table III gives shrinkage values for a number of wood species of commercial importance. Volumetric shrinkage, as the name shows, is the reduction in the volume of a piece as it drives below the fiber-saturation point. Radial shrinkage is the reduction in width of a quartersawed board as it dries, or, in other words, shrinkage in a direction from the growth center or pith of the tree to the bark. Tangential shrinkage is reduction in the width of a flat-sawed board, or shrinkage approximately at a right angle to the center-to-bark direction. Figure 2 shows forms of radial and tangential shrinkage. To convert the green-to-oven-dry values of the table, the following rules can be used: green-to-air-dry (approximately 15 per cent moisture content) shrinkage is about half the green-to-oven-dry shrinkage; green to 5-per-cent moisture content shrinkage is about four fifths of the green-to-oven-dry shrinkage.

In general the excess moisture in green lumber is removed in one of two ways. Either the lumber is carefully piled in the open to allow natural movement of the air to remove the excess moisture, or it is piled in a dry kiln where higher and better controlled temperatures are available as well as control of humidity and rate and direction of air circulation.

Air Seasoning and Kiln Drying

A general knowledge of the movement of moisture in wood enables one to understand the air seasoning process. It can be assumed that the moisture tends to distribute itself evenly through the wood, moving from the moist regions to the drier ones and, so far as loss of moisture to the air is concerned, losing moisture through the end grain more rapidly than through the side grain. Temperature and humidity at the surface of the wood (which depend to varying extents on the weather) are controlling factors, while circulation of the air, which can to some degree be altered, can be used to modify the two other factors as they exist in the pile.

Temperature, relative humidity, and rate of circulation of air all affect drying. The higher the temperature the more heat is available for the evaporation of moisture. Within limits, the lower the humidity the lower the moisture content on the surface of the board and the more rapid the transfusion of moisture from the inside of the board to the surface. The faster the circulation the more rapidly is heat made available for the evaporation of moisture and the more rapidly is the evaporated moisture carried away.

The movement of air in a lumber pile is the result of two general types of circulation. Horizontal circulation is caused primarily by local wind currents. Vertical circulation, on the other hand, is an internal movement produced by evaporation and the resulting differences in temperature throughout the pile.

Horizontal circulation can be regulated to some extent by variations in drying-yard layout, in foundation construction, and by piling methods.

Vertical circulation in a lumber pile is a seasoning factor of the utmost importance. As the green stock in the pile dries, the evaporation uses up heat, which is taken from the air in contact with the stock. This air, on becoming cooler and consequently heavier, tends to drop gradually toward the bottom of the pile. Methods of pile construction should therefore be designed to facilitate unobstructed flow of this heavier, damper air from the pile. To obtain the maximum benefit from vertical circulation, it must be adequate entirely across the pile from one side to the other. This means that adequate air channels, well distributed, are essential.

Partial stagnation and slow drying in the lower part of the pile naturally result from the downward flow of moist air unless special effort is made to prevent these effects. Increased horizontal circulation, for instance by increased sticker thickness, will help to eliminate stagnation in the lower part of the pile and to facilitate some outward flow of the heavier air due to the pressure of the downward movement in the vertical channels.

For the most part what has been said regarding air seasoning applies in principle to kiln drying, the treatment applied by the lumber manufacturers to woods intended for such purposes as cabinetwork and interior finish. The essential difference

is, of course, that in a properly designed dry kiln, lower moisture-content values can be obtained; conditions are susceptible of close control; are capable of acceleration to the maximum safe drying rate; and are not dependent on weather.

For easily dried stock a "natural" circulation kiln, that is, one deriving its main currents of circulation from air rising over the heating coils and falling within the lumber pile, can be used satisfactorily. For stock difficult to dry, a forced-circulation kiln is required if the degree of moisture is to be kept to a minimum. Schedules of temperatures and relative humidities suitable for the drying of most species of green or partially dried hardwoods and softwoods of commercial importance are available on request to the Forest Products Laboratory, Madison, Wis.

Wood should be kiln dried to the moisture content corresponding to that to which it will tend to come in service. Most of the values shown in Table II, previously cited, are obtainable only by kiln drying.

Seasoning Defects

Defects occurring in the drying of lumber include a considerable group due to shrinkage and a smaller group due to fungi. Check, honeycomb, various forms of warp, and loosening of knots, are in the first group. Blue stain which has its source in relatively high moisture content, is the principal stain of economic importance in the air seasoning of many species, both hardwoods and softwoods.

Lumber checks as the result of uneven shrinkage. Such shrinkage may be due to uneven drying or to the inherent difference between the radial and the tangential shrinkage of wood. Tangential shrinkage, the shrinkage across the width of plain-sawed stock, is on an average about twice as great as radial shrinkage, which is the shrinkage across the width of quarter-sawed stock. See Table III.

There are three common causes of uneven drying: (1) the end grain of wood gives off moisture faster than the side grain; (2) surface layers dry faster than the interior, especially during the early stages of drying; and (3) a portion of a board fully exposed to the drying effect of the air loses its moisture before an adjacent section not so exposed dries to the same extent.

The end checking of lumber during air seasoning is largely due to the uneven shrinkage caused by the exposed ends of the boards drying more rapidly than the adjoining portions. Not only does end grain give off its moisture faster than the side grain, but adjacent portions of both major side-grain surfaces, near or next to the ends are kept from contact with the air by the stickers that cover them. It follows that two courses are open for reducing the rate of end drying: in air seasoning the ends of the stock should be shaded from the sun and the area of board faces not exposed to the air should be reduced as much as possible. End coatings may be used in place of shading to decrease end checking.

During air seasoning or kiln drying season checks that appear on the faces of the stock result both from uneven drying and from the difference between tangential and radial shrinkage. Checks caused by uneven drying may be due to one of two conditions. With excessively rapid surface drying, the outer layers become much drier than those in the interior and tend to shrink before the inside portion. The stresses thus set up in the piece cause the surface to pull apart in the form of checks which may be visible at once or which will appear when the stock is run through the planer.

The other condition causing checking is present when a portion of the piece is shut off from the air. The exposed portion begins to shrink before the protected area is dry enough to do so, and checking occurs in the shrinking section because of the restraint of the unchanged zone. The checking in plain-sawed pieces for which the differential between tangential and radial shrinkage is responsible occurs because one face of the piece is closer to the heart of the tree, is therefore more nearly a radial face, and is therefore inclined to shrink less than the other. Such a piece also tends to cup, but because of the restraint of the stickers the stresses set up may result in checking. The avoidance of excessively rapid drying tends to reduce all forms of checking, and a decrease in the area covered by the stickers will help to reduce checking due to differences in exposure to the air, either outdoors or in a dry kiln.

The surface of a piece of green wood dries before the interior, and in consequence its shrinkage is opposed by the interior, which during the early stages of drying remains above the fiber-saturation point. During these stages the difference in tendency to shrink sets up a tension in the surface, which may result in checking and a compression in the interior, both effects across the grain. As drying progresses, the interior begins to shrink and in turn is restrained by the surface which is set in an expanded condition; that is, the surface has been prevented from shrinking and is consequently wider across the grain than it would be at the same moisture content if it had been free to change dimensions. The difference in shrinkage now results in a compression of the surface and a tension on the interior. The new compression may be sufficient to close any surface checks that have developed, and render them invisible. These checks may again become visible if the piece is later exposed to alternate high and low humidities.

The interior tension associated with the second stage of drying may exceed the strength of the bond between the wood fibers and tear the fibers apart. If this happens the resulting defect is honeycomb. As for the control of checking during air seasoning, piling methods that avoid too rapid drying will minimize the occurrence of honeycombing. During kiln drying, however, these defects are minimized by properly regulating the temperature and humidity.

When the surface of a piece of wood is set in an expanded condition, and consequently is in compression while the interior is in tension, the piece is said to be casehardened. When such a piece is resawed the new faces tend to become concave. When this defect is present to an objectionable degree it can be relieved by a steaming treatment in a dry kiln. For most purposes for which air-seasoned stock is used such procedure is not necessary.

"Warp" is the general term applied to any form of distortion, including cup, bow, crook, and twist. Usually these defects result from the uneven shrinkage caused by a lack of uniformity in the structure of the wood. Spiral, interlocked, or diagonal grain is commonly responsible, although crook is most frequently associated with a structural defect known as compression wood. Warping that may in a minor degree be due to aggravation of structural defects by drying can be reduced by piling methods that hold the stock firmly in place during air seasoning or kiln drying.

Other lumber defects are blue stain and decay. Blue stain is a discoloration produced by threads of the blue-stain fungus in the sapwood of such species as southern and ponderosa pine, northern and western white pine, red gum, sugar pine, basswood, and maple. This is a defect occurring in air seasoning, and depending on a combination of an abundant food supply in the wood, high moisture content in the wood (above 20 per cent), and warm weather. Slow drying and poor yard and sticker sanitation are the common causes of this defect. Preventive measures include steaming, chemical dips, yard sanitation, and yard practices that will permit rapid seasoning especially in the lower third of the pile.

Blue stain is not a form of decay but conditions liable to cause blue stain are also conducive to decay, and conditions that prevent one are helpful in avoiding the other.

Wood must have proper care in storage if the benefits of good kiln drying are to be retained. This is exemplified by a common experience of manufacturers of table tops and similar glued-up articles. Not infrequently kiln-dried hardwood lumber of good quality intended for use in table tops is solid piled in the shop or storage shed while awaiting use. This practice protects most of the side-grain surfaces satisfactorily, but under humid conditions such as exist in the summer, for instance, the end grain takes up moisture so that the ends of the boards have a higher moisture content than the center sections. If this results in an increase in width it may cause lack of glue and lack of pressure to

ruin good joint work when an attempt is made to join boards edgewise that are slightly wider at the ends than elsewhere. On the other hand, planing the boards back to uniform width may also cause trouble. In this case the ends of the boards, although of the same width as the rest of the boards, will shrink more than the center sections and the unequal shrinkage may pull apart glue joints or even cause the wood itself to open up. Piling the boards on stickers might mean a slightly higher average moisture content for the entire pile but it would at least bring about a more nearly uniform moisture content throughout.

A wintertime hint regarding the care of lumber in shop or factory has to do with the temperature carried in the shop during cold weather. When outside temperatures are running low the heated air inside tends to reach a very low humidity — perhaps as low as 5 per cent. The higher the temperature inside, the lower the humidity inside, and the greater the tendency for glue-joint work to open up and for checks to occur. A suggested remedy is to maintain a shop temperature in the neighborhood of 65 deg. F. To show the efficacy of this practice, it may be noted that if the indoor temperature is 80 deg. and the relative humidity 20 per cent, a lowering of the temperature to 65 deg. will increase the equilibrium moisture content of the wood (the moisture content it is trying to reach to balance atmospheric moisture) by 2 per cent, a decidedly worth-while increase under such severe conditions.

Exchange Units in Industrial Arts and Home Economics

L. H. Wood

Public Schools,
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A plan that has been successfully tried out in a number of cities.

For many years, girls have been given home-economics courses, and boys, shop courses somewhere between the fifth or sixth grade and the high school. These courses have changed greatly from the original cooking and sewing for girls and the woodwork and drawing for boys, but essentially the idea is still the same. Boys are trained either to work in the shop or to have some appreciation of shopwork, and girls are trained to sew and cook or to understand how to supervise someone else who may do the actual work.

However, conditions have changed. True, most men work with their hands and most women manage homes and bring up families, but working and living conditions have passed through a revolution. No longer must men be expert all-around mechanics in their lines. Instead of doing or even being able to do the whole job, most men must now be able to do one particular task on a more or less automatic machine. Such a worker can be trained to do his job in a comparatively short time and he usually becomes quite expert in a short while. Then, too, working hours have been shortened so that the worker has many leisure hours to spend at home or elsewhere.

In the home, conditions have been even more revolutionized. Where most work, was done by hand years ago, it now is largely mechanical. Electricity has taken over much of the drudgery of the home. Food comes in tin cans. Today, low-priced dress shops have taken the place of the home dressmaker, and furnace heat and closed cars have made the heavy clothing of yesterday unnecessary.

Years ago the man, as the breadwinner, often left for work at daylight and returned after dark, working ten, twelve, and sometimes more hours a day. He had neither time nor strength left to take part in home life. This has all been changed for most workers and they must, if the home is to be preserved, learn to find a major part of their leisure interest about the home. Why shouldn't men know something of foods, their selection and preparation? Why should they not know how to select suitable clothing, to use harmonious colors, to be gracious in entertaining, to do their share in making home life worth while?

For the woman of the house, the change has been even greater. The mothers and grandmothers of the past worked from daylight until late in the evening cooking, cleaning, sewing, and raising families. Everything was done in the hardest way, by hand, and the woman was practically confined to her house and yard. Practically all food had to be prepared in the home, most of the clothing was made in the home by hand; and without automobiles, good roads, and movies, entertainment had to be furnished by the home.

But now, while most of the hard work is done outside of the home, there is greater need for knowing how to make proper selection of appliances, how to keep them operating, and how to use to the best advantage the new helps that abound. A woman now needs also to know how to make simple mechanical repairs, and she must be able to decide when to call for a repairman. To know what to let alone and when to call for help is quite necessary today. If girls can be given an understanding of how the plumbing, heating, and lighting of home operates, if they can be trained to know how things *should* be about her home and how her laborsaving devices *should* work, she can keep a more harmonious home.

A few years ago one heard occasionally of cooking classes for boys in some places. These became quite popular with many boys and have really paved the way for the exchange unit, usually at the junior-high-school level, during which the boys of a certain grade report to the home-economics room to be taught by the home-economics teacher, while the girls report to the shop to be instructed in the mechanics of the home by the shopman.

In the high school, classes of this nature are usually elective and so reach only comparatively few of the boys and girls. When given in the junior high school an exchange unit can be put in as a required subject in a definite grade and so reach all of the children going through the school.

If work of this kind is worth doing, it is worth giving to everyone, and therefore it should be a requirement in the junior high school. Then if it is made interesting enough, some of the boys and girls may want to elect a more advanced course of the same nature in the senior high school. In fact, it has been suggested that such a course might be a requirement in high school also, probably in the last half, so as to reach the children within a year or so of graduation.

Wherever such work is given, care must be taken not to let it start as cooking or camp cookery for boys and the making of simple shop projects by the girls. Work of this sort is interesting to the children, as it is something different, but its purpose is not simply to interest the child. The school's job is to prepare them to be homemakers in a mechanical age.

To make these exchange units worth while, one half to two thirds of the time should be spent in the classroom learning how things should be. As consumers students need to know when things are right and what to expect rather than to know how to do everything themselves.

The woman who knows how to get the most out of the mechanical appliances in her home will be able to make a more attractive place to live. The man who understands something of the woman's problem

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INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

History Repeats Itself

At the time the Century of Progress was held at Chicago depicting how far our civilization had surpassed that of the years gone by, the great city in which the fair was held found it necessary to curtail the money which was sorely needed to educate its youth. Especially hard hit were the fields of industrial arts and vocational education.

Since then, Chicago and the country at large have begun to realize that industrial arts is a phase of general education that needs to be stressed more and more in the education of our youth for life in the present-day civilization.

Now we find another great city, holding a fair to picture the progress which America has made in using science to direct the forces of nature and making them do the work of man. This great city too, is calmly voting to curtail the educational advantages it has hitherto offered to its youthful and adult citizens in vocational and trade schools in day and evening classes.

There are, of course, many businessmen and industrialists who have amassed fortunes in spite of the fact that they did not have the training now offered. Such men — they call themselves successes, as if money alone spelled success — can readily see that great savings can be achieved by curtailing industrial-arts and vocational-education courses to which the youth of today is entitled.

These men do not seem to understand that the results of their present decisions cannot be measured until years hence when another catastrophe may show how poor their judgment was when they casually slashed the educational budget. By their very inability to provide a solution for the economic problems of the day, which would enable them to provide jobs for at least the older ones whose education they are now making impossible, they admit that they, the so-called leaders, are powerless to advocate anything but the easy way out. Without further ado, therefore, they throw the young people for whom they have no jobs, into enforced and profitless idleness from which can be bred only surly tempers, dissatisfaction, dissention, crime, and eventual revolution.

Probably there is some truth in the oft heard assertions, "We are spending too much for education, our educational efforts lack effectiveness, our educational system needs improvement." Grant all of these allegations. Will education become more effective or can it be improved by depriving it of the means needed to carry it on? Is it better to spend money for educating youth and to guide them toward a better way of living in present-day society, than to let them live lives of idleness without guidance which will land only too many in penal institutions? Unfortunately our reformatories and prisons already cost huge sums from which little return can be expected except that for the time of a wrongdoer's incarceration, society may be free from his misdeeds.

But how can the educator make the taxpayer, his board members, and the legislators see the great need of maintaining, if not broadening out, the educational offerings of our school. This can be done only by a well-planned program of enlightenment. What are we doing for the student who comes to our classes? All our efforts in the past have given the man on the street, the taxpayer, the member of our boards of education, yes, our own educational administrators, a rather meager picture of the need for industrial arts and vocational education. Our own efforts at doing a better job in many cases, has not been too strenuous. Probably we, who advocate industrial arts and vocational education, are to be greatly blamed ourselves for receiving more than our share of the budget cuts.

It is high time that we make a careful, yes a humble analysis of our jobs, and then put forth a much greater effort into the selling of our product, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, to all those through whom must go our efforts, in order that we may be able to provide our share in properly educating and guiding the youth of our land.

Inculcating Proper Habits

While the incident recorded here happened more than twenty years ago, and for that reason might be said to be completely out of date, it may, nevertheless, still find an application in the training of the workers of tomorrow. Every shop teacher knows that he, too, must try his best to instill the right kind of habits in his students if they are to be fully trained to live a normally successful life.

Among the many other habits that need to be made part of the student's stock in trade for meeting life is the one demanding honesty of effort, and of fairness with one's employer, fellow employees, and with oneself. Probably the story recounted here, which is based on true facts, may be used to illustrate this point.

In one of the departments of a well-known factory, there were a large number of automatics, which, in order to keep up production, were kept running day and night. The night shift was supervised by a foreman who was rather easy on his men, and who himself set the bad example of retiring to his office and catching forty winks. It was quite natural that some of the men at the machines would try similar dishonest methods. Usually the mechanic who set up the machines would supervise a number of the automatics, and a helper would see that the machines would be fed with the required stock. After the machines were running, the mechanic would check the parts produced every five or ten minutes to see that the proper limits be maintained. It would be only occasionally that adjustments would have to be made, but the need for doing so would arise at the most unexpected moments.

The output of each of the automatics ran into the thousands per hour, hence, continued vigilance was imperative. One night one of the mechanics in this department came on the job with a rather heavy head. As soon as he had his machines running, and after having checked up rather perfunctorily, on the sizes of parts produced, he seized the first opportunity after the foreman had made his rounds, to inform the helper to keep the automatics supplied with stock, and to call him if anything went wrong. The mechanic then retired for a snooze. Of course, the helper did not check for sizes, the pins, that were being turned out by the thousands each hour, and the mechanic did not wake up for almost two hours. When he did return,

he found that one of the automatics had been producing pins several thousands of an inch below the minimum allowable size. Rather than face the music, he packed up his belongings and left to look for another job.

The machine has tremendously stepped up production. It has made man's job easier by reducing the drudgery of hand-work. However, it has also put new demands on the worker. It requires not only that he be skillful in the manipulation of the machine, but also that he possess traits of character that are equally important in the holding of his job. The high price of some automatics, for instance, would require an overhead charge which would far exceed the hourly wage of the men attending it. Leaving such a machine without supervision then, is taking a chance or causing a loss of just that much money. Then too, the cost of the spoiled material and the cost of the labor must be added.

Besides this, the dishonesty of this man gave a bad reputation to all the men working on the night shift. The surveillance was made unnecessariiy severe on all of these men, making working conditions that had been tolerable, now almost unbearable. Furthermore, the story soon spread about in the community and the mechanic found it difficult to live down the character which he had unwisely given himself.

The students in our schools are being prepared to be the mechanics of tomorrow. They must be given opportunity to acquire the right habits, and they must also be shown the consequence of neglecting to do that which honesty requires of one. They must be taught that most of them, no doubt, will always be employees, but that everyone has the opportunity of being his own boss, providing he builds up a reputation of being thoroughly reliable and trustworthy.

Character training is one of the most important phases of all education, and every teacher, no matter what his subject, must do his part in so guiding and forming the minds and lives of his students that even if they are not paragons of skill and knowledge, they may nevertheless be depended upon to the limit of their capabilities, to perform the duties entrusted to them.

Industrial Museums

In the office building of the Worcester Pressed Steel Corporation, Worcester, Massachusetts, is housed a museum and library in which are examples of the use of iron and steel from ancient and modern times. There are also numerous volumes containing the theoretical and scientific material bringing to us what science and practice has learned about this valuable commodity during the centuries.

This museum and library is the pet hobby of Mr. John W. Higgins, president of the firm. It was he who had the vision that a museum of this kind would be a valuable asset to the steel industry as a whole, to the worker in the many plants where steel is used, to the apprentice just starting out on his trade, and to the high-school student who is trying to determine down which avenue he is to travel in this age of multitudinous trades and occupations.

The museum is housed in a steel and glass building adjoining the steel mills. In one wing are exhibited the ancient products of the steelmaker's art. The outstanding part of this group is a number of armored knights, mounted on equally well-armored horses, showing excellent examples of the armorer's work dating back to the fifteenth and sixteenth century.

On the main floor one may study the utensils, weapons, and tools of the Stone Age and the Bronze Age. Then come the metal tools, weapons, and shields of the Greeks and the Romans, and these are followed by the armor, weapons, and other metal articles used by the Crusaders.

In the modern wing are examples of the many shapes and forms of pressed, drawn, and stamped steel with which industry is acquainted today. All of the exhibits are clearly labeled, showing comparative weights, strengths, and costs, and nowhere is there a "Don't touch" sign.

Craftsmen visit the museum to compare their products with those produced by the ancient steel and metalworkers. The machine-hand, employed on the modern production machine, comes to get an insight into his contribution to the steel industry and thus bolsters up his self-respect and the satisfaction of his own accomplishment as he views his work as an integral part of what is done by the steel industry at large.

The apprentice gets inspiration, respect for what the past has done, pride of what he and his fellow workers are accomplishing, and perhaps even dreams of future development of the uses to which steel is now put.

The high-school boy learns something about the romance of steel, imbibes incidently, a great deal of historical and geographical knowledges, and discovers many facts which may guide him in the discovery of his own vocation.

To show that this museum has real value, it needs but to be mentioned that it is visited by upwards of 10,000 people each year. It is open to the public on every working day from 8 A.M. to 5 P.M., as are also the offices and mills of this enterprising corporation.

Would that there were more Higginses with broad visions who would establish industrial and commercial museums and open up their plants so that youth and adult could become better acquainted with the activities of the individual industries and learn more about how they all dovetail into one another in state-wide, national, and world-wide industry and commerce. What a wonderful opportunity would the shop teachers then have to give real vocational guidance to the students under their care. Would it not be worth while to work toward this end? The teachers of industrial arts and vocational education are usually well acquainted with the major industries in their own localities. It would not be so difficult for them to contact men in key positions who might be influenced to emulate what John W. Higgins has done in Worcester. The first attempts need not envisage more than probably a corner in the office of one of the industries in which examples of raw and finished products can be displayed. Other commercial and industrial plants may then be interested in following suit. Some of the men who are trying out the idea may get the broader vision and expand their museums to worth-while dimensions as was done at Worcester. Probably too, communities may see the value of these efforts, and establish municipal museums of industry and commerce.

At any rate, the idea has value and it is hoped that it may be adopted by many plants, industries, and cities, so that eventually, the youth and interested adult may have the opportunity, from coast to coast, to study at firsthand the raw materials, the processes, and the finished product of the commerce and industry of his country.

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in managing a home will make a more appreciative husband. Home must be interesting, harmonious, and beautiful — in short, a happy place in order that it may be the center of our affections — and if it is not, then the home, as it is now known, will die. If children have to seek their pleasure elsewhere, the home will become unnecessary to them and by the time they are ready to have homes of their own, their interests will be so divorced from the home that it will be practically a thing of the past. The fact that Americans are fast becoming a nation of apartment dwellers indicates that this trend has already made deep inroads into American home life and needs to be dealt with now.

A busy home is usually a happy home. If we understand our homes, how to take care of them and how to use them they will become real homes. People like to be in such homes. They feel the peace and harmony that pervades in them, and instead of getting away from them as much as possible, homes can be made inviting havens for everyone. The school, therefore, must do its part in giving the students the training that will help them fit more perfectly into the home of today and tomorrow, and the exchange unit may be one method of arriving at an acceptable solution.

Teaching Materials for Industrial Education

Chris H. Groneman

East Texas State Teachers College, Commerce, Texas

The following list of free or inexpensive teaching aids was collated to help the teachers in all departments of industrial arts and vocational education.

The list has been carefully checked and it is hoped will be found very helpful. Shop teachers should remember, however, that while much of this material is sent gratis to teachers, nevertheless its production has cost considerable money to the manufacturers and dealers who are furnishing it. For that reason it is no more than right that enough postage to cover carriage charges should accompany each request.

Auto-Mechanics Division

Ford Motor Co., 3674 Schaefer Road, General Sales Department, Dearborn, Mich., "Mechanical Assembly Chart" (limited supply available); "60 and 85 HP Model Instruction Books"; "A Visit to the Rouge Plant Booklet" (free).

General Motors Corp., Customer Research Staff, Detroit, Mich., "Diesel and Modern Power"; "The Philosophy of Customer Research"; "Chemistry and Wheels"; "When the Wheels Revolve"; "Putting Progress Through Its Paces"; "The Automobile Buyers' Guide"; "Consumer Research and Consumer Education"; "Good Housekeeping in Your Car"; "Mechanical Servants"; "The Evolution of the Motor Car"; "Four Cycle Engine"; "This Question of Cylinders"; "From All Fields of Science"; "The Short Hand of Highway Signs"; "One Hundred Years Ago"; "Preview of Progress"; "We Drivers"; "How to Park in a Tight Place" (free).

Goodyear Rubber Co., 1144 E. Market St., Akron, Ohio, "The Story of the Tire"; "Silent Motion Pictures"; "Descriptive Booklet of Industrial Adventures" (free).

B. F. Goodrich Co., Akron, Ohio, "Wonder Book of Rubber."

Hood Rubber Co., Inc., Boston, Mass., "Educational Exhibit" (60 cents).

Nordberg Mfg. Co., Advertising Dept., Milwaukee, Wis., "Carthage Water and Electric Plant"; "Diesel Engines Supply the Power"; "Some Notable Diesel Engine Installations"; "The Panama Canal Diesel-Engined Power Plant" (limited supply left — free).

Ohio Oil Company, Marketing Division, Findlay, Ohio, "Five Eventful Decades" (free).

Pep Mfg. Co., 33 W. 42nd St., New York, N. Y., "Samples of Valve Grinding Compound" (free to instructors); "Informational Circulars on Pep Products" (free).

South Bend Lathe Works, 425 E. Madison St., South Bend, Ind., "Bulletin No. 1-A — How to Grind Valves"; "Bulletin No. 2-A — How to Service Armatures"; "Bulletin No. 4-A — How to True Brake Drums"; "Bulletin No. 5-A — How to Service Differentials"; "Bulletin No. 6-C — How to Bore Connecting Rods"; "Bulletin No. 7-S — How to Make Bushings"; "Bulletin No. 9 — How to Finish Pistons"; "Bulletin No. 35 — How to Grind Cutter Bits"; "Bulletin No. 36 — How to Cut Screw Threads" (10 cents); "How to Run a Lathe" (25 cents); "South Bend Machine Shop Course Book No. 39-M" (50 cents); "Auto Service Catalog No. 64"; "Vocational Bulletin No. 57, The School Shop"; "Modern School Shop Bulletin, No. 55-Y"; "Bulletin No. 31-A — Farm Mechanics in the School Shop"; "Bulletin No. 88 — Modern Industrial Shops"; "Blueprint No. 250 — How to Become a Machinist"; "Catalog No. 98"; "Bulletin No. 33-J, Workshop Lathe in the Automotive Service Shop" (free).

Although the bulletins are regularly priced as indicated, the South Bend Lathe Works will be glad to supply copies free of charge to instructors or supervisors who write to them, requesting the bulletins.

Standard Oil Co., Technical Dept., 1910 S. Michigan Ave., Chicago, Ill., "Petroleum Drilling and Production"; "Petroleum Products"; "Mine Car Lubrication"; "A Story of a Service"; "Oil Comes to the Farm"; "Petroleum Transportation, Storage, and Marketing" (free).

United States Rubber Co., Box 12, Station G, Educational Dept., New York, N. Y., "Educational Experimental Kit" (25 cents).

Willard Storage Battery Co., 246–286 E. 131st St., Cleveland, Ohio, "The Starting and Lighting Battery"; "The Nerve Center of Ten Million Cars" (limited supply — free).

Crafts Division

The American Crayon Co., Sandusky, Ohio, "How to Do Linoleum Block Printing" (free).

American Reedcraft Corp., 130 Beekman St., New York, N. Y., "Projects in Leathercraft; Raffia; Cane Seat Weaving; Colonial Chair Frames; Creative Handicraft" (free).

Craft Service, 360 University Ave., Rochester, N. Y., "Catalin" (free).

Eastman Kodak Co., Rochester, N. Y., "Elementary Course in Photography" (free on request to instructors teaching a course in photography, or sponsoring a camera club).

Gane Bros. & Lane, Inc., 1515 Pine St., St. Louis, Mo., "Bookbinders' Supplies Catalog and Samples" (free).

Gaylord Bros., Inc., 155 Gifford St., Syracuse, N. Y., "Bookcraft Instruction Manual" (book furnished free to school libraries).

W. A. Hall & Son, Boston, Mass., "Samples of Art Leathers" (free to teachers).

Harvard University, Harvard Film Service, Cambridge, Mass., "Series of Sight Motion-Picture Films Demonstrating Techniques of Stone Carving, Clay and Bronze Work, Etching, Dry-Pointing, Wood Engraving, Silversmithing, Spinning, Weaving, and Metalwork" (descriptive folders free).

Magnus Brush and Craft Materials, 24 Water St., Wakefield, Mass., "Electric Wood Etching" (free).

Needle Craft Magazine, Augusta, Me., "The A-B-C's of Reed Work" (10 cents).

H. H. Perkins Co., 256 Shelton Ave., New Haven, Conn., "Reedcraft" and "Seat Weaving" (free).

Practical Arts Publishing Co., 44 Vista Ave., Elizabeth, N. J., "Hobby Booklet" (free).

Harold J. Stahle & Sons, New Cumberland, Pa., "Syllabus on Archery" and "York Archery Tackle" (3 cents).

Tanners Council of America, 100 Gold St., New York, N. Y., "The Romance of Leather" (free).

Thayer & Chandler, 910 Van Buren St., Chicago, Ill., "The Idea Book" (free).

Charles Toebe Leather Co., 149 N. Third St., Philadelphia, Pa., "Leathercraft Manual" (free).

Universal School of Handicrafts, Inc., 25th floor, RKO Bldg., Rockefeller Center, New York, "Synthetic Amber Manual of Instructions" (25 cents); "Chip Carving" (out of print); "Manual on Inner-Tube Toys" ($1); "Manual on Nonfiring Clay" (25 cents); "Manual on Card Weaving" ($1). Supply Catalog free to teachers, otherwise 25 cents.

Drawing Division

The American Crayon Co., Sandusky, Ohio, "Prang Water Colors"; "Crayonexing";

"Sketching Materials"; "Prang Tempera Chart"; "Prang Tempera"; "Prang Powder Tempera Chart"; "Prang Powder Tempera"; "Excello Squares"; "Ambrite Colored Blackboard Crayons"; "Milo for Modeling"; "Art and the Businessman"; "Color Harmony Booklet"; "Simplifies Color Teaching"; "Art Ideas for the Beginner"; "Holdtu Paste"; "Poster Partfolios" (free).

American Lead Pencil Co., 500 Willow Ave., Hoboken, N. J., "Story of the Lead Pencil, No. 13" (free).

Eugene Dietzgen Co., 2425 Sheffield Ave., Chicago, Ill., "Use and Care of Drawing Instruments"; "Lettering Chart" (free).

Charles H. Higgins Co., 271 9th St., Brooklyn, N. Y., "Higgins Correlation Projects 1, 2, 3, 4, 5, 6, 7, and 8."

Keuffel & Esser Co., 520 S. Dearborn St., Chicago, Ill., "Instructions for Use of K and E Architects' Levels" (free).

National Coal Association, Southern Building, 15th and H Sts., N. W., Washington, D. C., "The 1939 Basement Plan Book" (free).

C. F. Pease Co., 2601 W. Irving Park Rd., Chicago, Ill., "Instructions in Making Blue Prints" (free).

Frederick Post Co., Box 803, Chicago, Ill., "Architectural and Engineering Symbol Charts"; "Drawing Equipment Guides" (free).

Electrical Division

L. B. Allen Co., Inc., 6767 Mawr Ave., Chicago, Ill., "Samples of Aluminum Solder"; "Aluminum and How to Solder It" (free).

Amber Mines, Inc., 9 Rockefeller Plaza, Rockefeller Center, New York, N. Y., "New-Amber Varnish" (free).

American Telephone & Telegraph Co., 195 Broadway, New York, N. Y., "The Magic of Communication" (free).

Burgess Battery Co., 500 W. Huron St., Chicago, Ill., Information on Burgess Products and Perforated Ventilating Ceiling obtainable through Johns-Manville Sales Corp., U. S. Gypsum Co., and National Gypsum Co.

Coleman Lamp and Stove Co., Wichita, Kans., "Handy Helps for Homemakers" (free).

Electric Storage Battery Co., Allegheny Ave. and 19th Ave., Philadelphia, Pa., "Fundamentals of Storage Battery"; "Instructions on Operating the Battery"; "Battery Lecture Wall Chart" (free).

General Electric Co., 1 River Road Schenectady, N. Y., "Electrical Laboratory Apparatus and Educational Service, No. GEA-1185-G"; "Laboratory and Shop Equipment, GEB-62-A"; "General Electric Motion Pictures, GES-402-C"; Construction Data for ½ h.p. Single-Phase Induction Motor, GEA-2140-A; For ¾ h.p. 3-Phase Induction Motor, GEA-2138; "Electronics and Electron Tubes, GET-568" (25 cents); "Experimental Electronic, GET-566 and 620" (2 copies) (25 cents); ¼ h.p. Single-Phase, 60 Cycle, 110 Volt Motor Bulletin, GES-909 (free); ½ h.p. Single-Phase, 60 Cycle, 116/220 Volt Motor Bulletin, GEA-2140A (free); ¾ h.p. 3-Phase, 60 Cycle, 110 Volt Motor Bulletin, GEA-2138 (free); 250 Watt Compound-Wound DC Generator Bulletin, GEA 2289 (free); 1½ KW, 220-110/55 Volt, Single-Phase, Air-Cooled Transformer, Bulletin GET-569 (free); Educational Service, Bulletin GEA-1185G (free); "Essential Items for an Electrical Laboratory Bulletin, GEB-62B" (free).

General Motors Corp., Detroit, Mich., Wall Chart "From All Fields of Science" (free).

Kester Solder Co., 4201 Wrightwood Ave., Chicago, Ill., Samples of Kester Acid-Filled Plastic Rosin-Filled Solders (free).

Magnus Brush and Craft Materials, 24 Water St., Wakefield, Mass., "Electric Wood Etching" (free).

National Board of Fire Underwriters, 222 W. Adams St., Chicago, Ill., "National Electric Code No. 70" (5 cents).

National Carbon Co., 30 E. 42nd St., New York, N. Y., "Fun With Batteries" (10 cents).

National Electric Products, Pittsburgh, Pa., "The Way to Wire a House"; "Stop, Have You Figured It Out?"; "New Method of Circuit Wiring" (free).

Standard Electric Tool Co., 1938 W. 8th St., Cincinnati, Ohio, Catalog No. 37, Tool and Supply Guide (free).

United States Electrical Tool Co., 2438 W. 6th St., Cincinnati, Ohio, General Catalog Guide of Electrical Tools (free).

Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago, Ill., "List of Inspected Electrical Equipment, May, 1938"; "Electric Service With Safety"; "List of Inspected Appliances Relating to Accident Hazard Automotive Equipment, Burglary Protection, Sept., 1938"; "Inspected Electrical Equipment, Supplement to May, 1938 List" (free).

Westinghouse Electric & Mfg. Co., 20 North Wacker Drive, Chicago, Ill., "Lighting Handbook — Artificial Light and Its Application" (75 cents); "Light Through the Ages" ($2.50 per C.); "Light of Your Life" ($25 per M.); "Our Eyes a Priceless Gift" ($17 per M.); "Westinghouse Illumination Design Handbook" (10 cents); "Light in the Home" (5 cents).

Weston Electric Instrument Corp., Newark, N. J., Monograph B-7: Wall Charts of Weston Instruments (free to science and physics instructors).

Industrial Division

American Petroleum Institute, Dept. of Public Relations, 50 West 50th St., New York, N. Y., Petroleum Drilling and Production Chart; Petroleum Products Chart; Petroleum Transportation, Storage, and Marketing Chart (free).

American Telephone and Telegraph Co., 195 Broadway, New York, N. Y., "The Magic of Communication" (free).

Armstrong Cork Co., Lancaster, Pa., "The Story of Cork" (out of print).

Atchison, Topeka and Santa Fe Railway System, Railway Exchange, 80 E. Jackson Blvd., Chicago, Ill., "Conquest"; "The Railroad" (free).

Bakelite Corp., 247 Park Ave., New York, N. Y., "Versatile Service of Bakelite Materials" (free).

Chemical Publishing Co., 148 Lafayette St., New York, N. Y., "Index of Scientific and Technical Books of the United States and England No. 6" (30 cents).

Corn Industries Research Foundation, 270 Broadway, New York, N. Y., "Tapping the Treasure in Corn"; "Corn in Industry"; "Industrial Corn" (free).

Fleisher Yarns, Inc., 32–36 Mercer St., New York, N. Y., "From the Bishop to the Needle" (free); "Fleisher's Wool Industrial Exhibit" ($2).

B. F. Goodrich Co., Akron, Ohio, "Wonder Book of Rubber" (free).

Goodyear Rubber Co., 1144 E. Market St., Akron, Ohio, "Story of the Tire" (free).

Hammermill Paper Co., Erie, Pa., "Hammermill Educational Exhibit, Students' Packet" (10 cents); teachers' packet, (15 cents); classroom exhibit (25 cents); chemistry and science exhibit ($1); college and museum exhibit ($3).

Hood Rubber Co., Inc., Boston, Mass., "Educational Exhibit" (60 cents).

Institute of Public Relations, 50 W. 50th St., New York, N. Y., Petroleum Drilling and Production Chart; Petroleum Products Chart; Petroleum Transportation, Storage, and Marketing Chart (free).

Lone Star Cement Corp., Merchants Bank Bldg., Indianapolis, Ind., "Cutting Concrete Costs" (free).

Masonite Corp., 111 W. Washington St., Chicago, Ill., Samples of products (free).

Morton Salt Co., 208 W. Washington St., Chicago, Ill., "The History of Salt" (free).

Plate Glass Manufacturers of America, First National Bank Bldg., Pittsburgh, Pa., "Plate Glass Booklet" (free; in quantities, 15 cents).

United States Rubber Co., 1790 Broadway, New York, N. Y., Educational Experiment Kit (25 cents); "Romance of Rubber" (free).

Vermont Marble Co., Proctor, Vt., "Miracles in Marble" (free).

Western States Envelope Co., 1616 W. Pierce St., Milwaukee, Wis., Guide of Envelope Information (free).

Wheat Flour Institute, 309 W. Jackson Blvd., Chicago, Ill., "From Wheat to Flour" (free).

Metalwork Division

Abrasive Company, Tacony and Fraley Sts., Philadelphia, Pa., "Grinding Wheel Data Book and Safety Code for Use of Abrasive Wheels"; "Tool and Cutter Grinding Wheel Folder"; "General Purpose Grinding Wheel Folder"; "Saw Gumming Folder"; "Knife Grinding Folder"; "Abrasive Grain Data Sheet No. 1"; "Centerless Grinding Bulletin"; "Snagging Wheel Bulletin" (free).

Air Reduction Sales Company, 42nd St., Opposite Grand Central, New York, N. Y., "How to Make a Bronze Walseal Joint"; "Sil-Fos Brazing Alloy"; "Handy Flux"; "How to Use 'Handy' Silver Solders Sil-Fos and Easy-Flo Brazing Alloys"; "Wilson Arc Welding Machines"; "Airco Flame Cutting Machines"; "Air Reduction Sales Company"; "The Story of Carbide"; "Care of Oxygen Acetylene Cylinders"; "Machine Gas Cutting in Modern Railroad Shop Practice"; "Multi Layer Aircowelding"; "Airco Process of Flame Hardening"; "Modern Money Saving Welded Piping"; "Have You Considered Low Temperature Brazing"; "Cast-Iron Welding"; "Welding Electrodes" (free).

L. B. Allen Co., Inc., 6767 Mawr Ave., Chicago, Ill., "Samples of Aluminum Solder"; "Aluminum and How to Solder It" (free).

Aluminum Company of America, Pittsburgh, Pa., "Welding Aluminum"; "Riveting Aluminum"; "Machining Aluminum"; "Finishes for Aluminum"; "Aluminum Paint Manual"; "New Industrial Arts Metal"; "Aluminum, Its History" (free to teachers).

American Gas Furnace Company, Elizabeth, N. J., "Buyer's Reference to Forges and Furnaces"; "American Heat Treating Furnaces and Machines" (free).

American Welding Society, 33 W. 39th St., New York, N. Y., "Code for Fusion Welding and Gas Cutting in Building Construc-

tion, including Appendices on Specifications for Filler Metals" (25 cents); "Code for Resistance Welding of Structural Steel in Building Construction" (5 cents); "Specifications for Welded Highway and Railway Bridges" (75 cents); "Practical Design of Welded Steel Structures, Priest" (25 cents); "Reports of Structural Committee on Welded Structural Joints" (50 cents); "Investigations of Welded Seat Angles" (25 cents); "Welded Beam-Column Connections" (25 cents); "Behavior of Filler Welds When Subjected to Bending Stresses" (25 cents); "Research Supplement each issue of Journal" (25 cents); "Standard Qualification Procedure" (25 cents); "Tentative Specifications for Iron and Steel Filler Metal" (25 cents); "Qualifying Welding Operators for Important Work" (5 cents); Welding Symbols and Instructions for Their Use" (25 cents); "A.W.S. Marine Code for Welding and Gas Cutting and Rules for Welding" (15 cents); "Rules for Fusion Welding Steam, Oil or Air Piping in Marine Construction" (25 cents); "Code for Fusion Welding and Flame Cutting in Machinery Construction" (25 cents); "Report of Committee on Welded Rail Joints" ($1); "Report on Welding or Cutting Certain Types of Containers for Combustibles" (10 cents); "Rules for Welding of Gravity Tanks, Tank Risers, and Towers" (25 cents); "Tentative Rules for Welding of Oil Storage Tanks" (25 cents); "Filing Classification of Welding, Brazing, Soldering and Cutting Processes" (50 cents); "American Society for Testing Materials — Impact Symposium" ($1); "A.S.A. Code for Pressure Piping" ($1); "A.S.M.E. Code for Unfired Pressure Vessels" (75 cents); "Complete Set Starred Codes in Flexible Cover Binder" ($9).

American Rolling Mill Co., Middletown, Ohio, "A Visit to Armco"; "What Metal Shall It Be?" (free).

Armstrong Bros. Tool Co., 317 N. Francisco Ave., Chicago, Ill., "Wall Charts on Lathe Tools"; "Planer Tools"; "Boring Tools" (free).

Atlas Press Co., 1819 N. Pitcher St., Kalamazoo, Mich., "Atlas Shop Equipment" (free); "Manual of Lathe Operation" (75 cents).

Behr-Manning Co., Troy, N. Y., "Abrasive Papers and Cloths"; "How to Sharpen"; "Lecture Course on Coated Abrasives"; "Sample Set of Coated Abrasives"; "Wall Chart of Production Illustrations"; "Product Chart of Industry's Woodworking Abrasives" (free).

Boice-Crane Co., Dept. IA-3-39, Toledo, Ohio, "Instruction Book on Metal Spinning" (10 cents).

Bureau of Mines Experiment Station, 4800 Forbes St., Pittsburgh, Pa., "Aluminum, from Mine to Market"; "Aluminum, Fabrication Processes" (free).

Canedy-Otto Mfg. Co., Chicago Heights, Ill., "Catalog No. 60" (free).

Carborundum Co., Niagara Falls, N. Y., "Carborundum Brand Products for the Home Craftsman" (free).

Carpenter Steel Co., Reading, Pa., "Temper-Color Chart" (10 cents); "Heat-Color Chart" (10 cents); "Tool Steel Simplified" ($1).

Certain-Teed Products Corp., 100 E. 42nd St., New York, N. Y., "Aluminum Surfaced Roofing and Shingles" (free to teachers).

Chicago Flexible Shaft Co., Roosevelt Road and Central Ave., Chicago, Ill., "Heat Range Chart" (free).

Chicago Gear Works, 769 W. Jackson Blvd., Chicago, Ill., "Gear Catalog of Gears, Sprockets, and Machine Data" (10 cents).

Cincinnati Milling Machine & Grinders, Inc., Cincinnati, Ohio, "Milling Machine Practice" (free).

Clemson Bros., Inc., Middletown, N. Y., "Metal Cutting With Hack Saw Blades" (free).

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio, "Handbook for Drillers"; "Ready Reference Book of Drill Tables" (free).

Clover Mfg. Co., Norwalk, Conn., "What Are the Various Coated Abrasives?" (free).

William Dixon, Inc., 32 E. Kinney St., Newark, N. Y., "Dixon Manual and Book of Designs" ($1.50); "Dixon Tool List" (free).

The Dumore Co., Racine, Wis., "Dumore Tap and Drill Chart" (free).

Fellows Gear Shaper Co., Springfield, Vt., "The Involute Gear"; "The Internal Gear"; "Operator's Handbook"; "Circulars on Nos. 4T and 6T Thread Generators" (free).

Fosdick Machine Tool Co., Cincinnati, Ohio, "Descriptive Catalog of Radials and Upright Drills"; "Power Required for Drilling No. 1"; "Power Required for Drilling No. 2"; "Horsepower Required for Drilling Machinery Steel"; "Horsepower Required for Drilling Cast Iron"; "Drilling Time in Minutes" (free).

Gallmeyer & Livingston Co., Grand Rapids, Mich., "Tap Grinders"; "Drill Grinders"; "Universal Cutter and Tool Grinders, Nos. 1½ and 2"; "Universal Cutter and Tool Grinders, Nos. 3 and 4" (free).

Grobet File Corp. of America, 3 Park Place, New York, N. Y., "Grobet Swiss Files Catalog" (free).

Handy & Harman Co., 82 Fulton St., New York, N. Y., "Handy Flux Bulletin No. 9"; "Brazing Alloys No. 5"; "How to Use Silver Solder and Brazing Alloys Bulletin No. 1" (free).

Hollup Corporation, 3337 W. 47th St., Chicago, Ill., "Welding Wire and Equipment"; "How to Weld 29 Metals."

K-G Welding & Cutting Co., 515 W. 29th St., New York, N. Y., "Oxy-Acetylene Cutting"; "Oxy-Acetylene Welding and Its Applications"; "Miscellaneous Uses of Oxy-Acetylene Flame"; "Welding Cores and Specifications"; "Tests for Selection of Operators of Welding Equipment"; "Bronze Welding or Hard Brazing or Cast Iron, and Malleable Iron by Oxy-Acetylene Process"; "Effect of Flame Cutting on Steel" (free).

Kester Solder Co., 4201 Wrightwood Ave., Chicago, Ill., "Samples of Kester Acid-Filled Plastic Rosin-Filled Solders" (free).

Kewanee Boiler Corporation, Kewanee, Ill., "Bulletins and General Catalog on Boilers and Their Products"; "Gauge for Reading Pipe Sizes" (free).

LeBlond Machine Tool Co., Cincinnati, Ohio, "Running a Regal"; "What Makes Main St."; "Wall Chart of Machine Lathe" (free).

Lehigh Steel Co., Bethune and Greenwich Sts., New York, N. Y., "Leco, The Nontempering Tool Steel"; "Croma Alloy Steel" (free).

Lux Visel, Inc., Elkhart, Ind., "Samples of Metallic X-1" (50 cents).

Lufkin Rule Co., Saginaw, Mich., "Handy General Catalog No. 12"; "Micrometer Chart"; "Decimal Equivalents Chart"; "Adjustment of Micrometer Calipers"; "Chart of U. S. Standard Screw Threads" (free).

Metropolitan Life Insurance Co., W. J. McConnelle, M.D., New York, N. Y., "First Aid"; "Calling All Drivers"; "How Safe is Home"; "Industrial Safety Education in Schools"; "Health Protection in Welding" (free).

Metal & Thermit Corp., 120 Broadway, New York, N. Y., "Thermit Welding"; "Murex Welding Information Booklet" (free).

Minnesota Mining & Mfg. Co., St. Paul, Minn., "Sandpaper is No Mystery"; "Faster and Better Finishes"; "Scotch Sandblast Stencil"; "Three M Tempered Garnet"; "You'll Save When You Use"; "The Better Finish Reflects"; "How to Do Refinishing in the Home"; "Elek-Tro-Cut Production Coated Abrasives"; "Wet or Dry"; "Scotch Fibre Tapes"; "Three M Floor Sanding Papers"; "Elek-Tro-Cut Ruff-Stuff"; "Scotch Cellulose Tape"; "Three M System for Appearance Reconditioning Automobiles"; "Catalog and Price List No. 36" (free).

Morse Twist Drill & Machine Co., New Bedford, Mass., "The Machinist's Practical Guide" (free).

National Tube Co., 208 S. LaSalle St., Chicago, Ill., "Correct Pipe Threading Principles" (free).

Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y., "Handy Reference Booklet No. 200-A"; "Floor Plans for Sheet Metal Classes No. 103-C" (free).

Nicholson File Co., Providence, R. I., "Wall Charts"; "File Filosophies" (free).

Norton Co., Worcester, Mass., "Norton Lecture Course" (free).

Oliver Machinery Co., Grand Rapids, Mich., "Installation, Care, and Operation of Oliver Circular Saw Benches"; "Proper Installation and Care of Oliver Band Saws"; "Wall Charts" (free).

Peck, Stow & Wilcox Co., Southington, Conn., "SB-35 School Bulletin" (free).

Power Transmission Council, Inc., 75 State St., Boston, Mass., "Lectures on Power Transmission" (free).

Remco Products Corporation, York, Pa., "Saving Money for Vocational Schools" (free).

Russel, Burdsall & Ward Bolt & Nut, Port Chester, N. Y., "R.B. and W. Handbook of Common Machine Fasteners"; "Standards Book — Bolt, Nut and Rivet Tables" (free).

Sargent & Co., P.O. Box 1940, New Haven, Conn., "Sargent Steel Square Booklet" (free).

Sears, Roebuck & Co., Chicago, Ill., "Instructions for Installing Modern Plumbing Systems"; "Instructions for Installing Steel Pipe Drainage and Vent Systems with Threaded Connections" (free).

Simons Saw and Steel Co., Fitchburg, Mass., "Hacksaw-ology"; "How to File a Cross-Cut Saw"; "File Facts"; "Methods of Cutting Metal"; "The Circular Saw"; "Care and Use of Circular Saws for Woodworking" (free).

S.K.F. Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa., "Engineering Data Sheets of S.K.F. Products"; "S.K.F. Ball and Roller Bearing Pillow Blocks and Shaft Hangers"; "S.K.F. Ball Bearing Fan and Blower Boxes" (free to teachers).

Smooth-on Mfg. Co., 568 Communipaw Ave., Jersey City, N. J., "Smooth-on Handbook" (free).

South Bend Lathe Works, 425 E. Madison St.,

South Bend, Ind., "Bulletin No. 1-A — How to Grind Valves"; "Bulletin No. 2-A — How to Service Armatures"; "Bulletin No. 4-A — How to True Brake Drums"; "Bulletin No. 5-A — How to Service Differentials"; "Bulletin No. 6-C — How to Bore Connecting Rods"; "Bulletin No. 9 — How to Finish Pistons"; "Bulletin No. 7-8 — How to Make Bushings"; "Bulletin No. 35 — How to Grind Cutter Bits"; "Bulletin No. 36-A — How to Cut Screw Threads" (free); "Machine Shop Course 55-A" superseded by "Machine Shop Course Book No. 39M" (50 cents); "Auto Service Job Manual No. 56," superseded by "Service Catalog No. 64" (free); "Vocational Bulletin No. 57, The School Shop"; "Modern School Shop Bulletin No. 55-W", superseded by "Modern School Shop Bulletin No. 55-Y"; "Bulletin No. 31-A, Farm Mechanics in the School Shop"; "Bulletin No. 88, Modern Industrial Shops"; "Blueprint No. 250, How to Become a Machinist" (free); "How to Run a Lathe" (25 cents); "Catalog No. 98"; "Bulletin No. 33-J — Workshop Lathe in the Automotive Service Shop" (free to teachers).

Stanley Tools, New Britain, Conn., "Joy of Accomplishment Booklet"; "Expert Soldering Booklet"; "Stanley Tool Catalog"; "Steel Square Booklet" (free); "Tool Guide" (25 cents); 16 wall cards for 32 charts illustrating tools ($1.50); Plan Packet, 26 prize designs (50 cents); plane iron bevel gauge (10 cents).

Sterling Wheelbarrow Co., Milwaukee, Wis.. "Sterling Wheelbarrow Foundry Book No. 49" (free).

U. S. Department of Commerce, National Bureau of Standards, Washington, D. C., "Hoover Plumbing Code" (35 cents); "Biennial Census of Manufacturers, 1933" ($1.25); "Biennial Census of Manufacturers, 1935" ($1.75).

Superintendent of Documents, U. S. Printing Office, Washington, D. C., "Simple Plumbing Repairs Bulletin No. 1460" (5 cents); "Farm Plumbing Bulletin No. 1426" (5 cents).

Universal School of Handicrafts, Inc., Rockefeller Center, 1270 6th Ave., New York, N. Y., "Manual on Nonfiring Clay" (25 cents).

Warn Machinery Co., 664 W. Washington Blvd., Chicago, Ill., new Catalog ready.

The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio, "Instructions for Grinding and Setting Cutters"; "Know Your Turret Lathe"; "Warner & Swasey Turret Lathe"; "Many Pieces in Small Lots at Little Cost"; "Eye Openers"; "Challenge to American Industry" (free).

White Metal Rolling & Stamping Corp., Moultrie & Colyer Sts., Brooklyn, N. Y., "Teaching Aids for Metal Work" (6 cents).

J. H. Williams & Co., 75 Spring St., New York, N. Y., "How to Select and Use Wrenches"; "Tools of Industry" (free).

Wrot Iron Designers, 541 W. 35th St., New York, N. Y., "Wrought Iron and Beaten Metal" (free); "Suggested Courses of Study" (free); "Finishes of Iron" (free); "Instructions for Etching" (free); "Tool Equipment List for Cold Bend Wrought Iron" (free); "Tool Equipment for Beaten Art Metal Work" (free); "Metalsmith Booklet for Simple Projects" (25 cents).

Woodworking Division

Abrasive Co., Tacony and Fraley Sts., Philadelphia, Pa., "Grinding Wheel Data Book and Safety Code for Abrasive Wheels"; "Tool and Cutter Grinding Wheel Folder"; "General Purpose Grinding Wheel Folder"; "Saw Gumming Folder"; "Knife Grinding Folder"; "Abrasive Grain Data Sheet No. 1"; "Centerless Grinding Bulletin"; "Snagging Wheel Bulletin" (free).

American Chime Clock Co., 1659 Ruffer St., Philadelphia, Pa., "Build Clocks for Pleasure" (free).

American Lumberman, 431 S. Dearborn St., Chicago, Ill., "Touch Wood" (15 cents).

American Reedcraft Corp., 130 Beekman St., New York, N. Y., "Raffia"; "Projects in Leathercraft"; "Cane Seat Weaving"; "Colonial Chair Frames"; "Creative Handicraft" (free).

American Screw Co., Providence, R. I., "Wood Screw Chart"; "Circulars on Phillips Recessed Head Screws" (free).

American Vocational Association, Inc., Denrike Bldg., 1010 Vermont Ave., Washington, D. C., "Standards of Attainment in Industrial Arts Teaching" (free).

American Walnut Mfg. Association, 616 S. Michigan Ave., Chicago, Ill., "Story of American Walnut"; "American Walnut for Interior Woodwork and Paneling"; "Woodwork of American Walnut for Homes of Moderate Cost"; "Interiors of American Walnut"; "How to Identify Walnut and Avoid the Substitute"; "Black Walnut"; "Graph of Physical and Mechanical Properties of Well Known Cabinet Woods" (free).

Appalachian Hardwood Mfgrs., Inc., 414 Walnut St., Cincinnati, Ohio, "Appalachian Hardwoods"; "Appalachian Yellow Poplar"; "Appalachian Beech, Birch, and Maple"; "Protection Through Selection"; "Chestnut as a Core Wood"; "Appalachian Hardwood Wall Paneling" (free).

Art Inlayers, 2695 21st Ave., San Francisco, Calif., Catalog (25 cents); "Simplified Inlaying of Pictures and Novelties" (25 cents); "Veneering Requiring Little Equipment" (25 cents).

E. C. Atkins & Co., 402 S. Illinois St., Indianapolis, Ind., Demonstration saw loaned: "The Saw Sense"; "Directions for Fitting Narrow Bands"; "Small Circular Saws Booklets" (free); "How to Do It Book" (10 cents).

Behr-Manning Co., Troy, N. Y., "Abrasive Papers and Cloths"; "How to Sharpen"; "Lecture Course on Coated Abrasives"; "Sample Set of Coated Abrasives"; "Wall Chart of Production"; "Product Chart of Industry's Woodworking Abrasives" (free to teachers).

A. A. Boyle Co., 257 Cornelison Ave., Jersey City, N. J., "Two Hundred Things to Do With Plastic Wood" (free).

California Redwood Association, 405 Montgomery St., San Francisco, Calif., "Redwood to the First Floor"; "Sandblasting, Wire Brushing, Torching, and Adzing"; "Small Greenhouses"; "Termites and Their Control"; "Redwood Crib Construction"; "Timber Fastenings"; "Nailing"; "Redwood for Stadia and Ball Parks"; "California Redwood Lumber Industry"; "Redwood Irrigation Gate (single-wall type)"; "Redwood Irrigation Gate (double-wall type)"; "Redwood Fence Posts, Anchors, Braces"; "Redwood Farm Gates"; "Redwood Portable Fence Panels"; "Redwood Dry Mash Feeder Type A"; "Redwood Dry Mash Feeder Type B"; "Redwood Portable Hurdles and Pens"; "Self-Feeding Mash Hopper Type 1"; "Self-Feeding Mash Hopper Type 2"; "Redwood Combination Feed-rack for Cattle"; "Redwood Nests for Poultry"; "Feed-rack for Sheep"; "Trays — Hay Stack Turkey Nests"; "Boards for Haystack Covers"; "Rabbit Hutches"; "Utility Barn"; "Portable Poultry House"; "Poultry Feeder"; "Septic Tank"; "Lumber Letter No. 7 on Nailing"; "Lumber Letter No. 6 on Stiffness, Hardness Shock Resistance"; "Lumber Letter No. 5, Density, Specific Gravity, Weight"; "Lumber Letter No. 4, Shrinkage"; "Lumber Letter No. 3, Strength"; "Lumber Letter No. 2, Durability"; "Lumber Letter No. 1, Physiology of Trees" (free).

E. L. Bruce Co., Memphis, Tenn., Set of Leaflets "Historic Plank Floors in Home of Today"; "Insure Against Moths"; "Heart of the Room Bruce Oak Floors"; "Keep Your Hardwood Floors Beautiful"; "Maple for Durable Floors of Beauty"; "Here's Grand News About Floors"; "Sensational New Wax"; "Here's Something Different in Hardwood Floors" (free).

Carborundum Co., Niagara Falls, N. Y., "Educational Exhibit of Ingredients and Products"; "Romance of Carborundum No. A-111"; "Abrasives in Service of Industry No. A-617"; "Grinding Cemented Carbide With Green Grit Wheels No. A-742"; "Diamond Wheels for Sharpening, Conditioning, and Lapping Hard Cemented Carbide No. A-894"; "Mounted Wheels for Portable and Internal Grinding A-766"; "Carborundum Brand Finishing Compounds No. A-721"; "Carborundum Brand Products for the Home Craftsman No. A-714"; "Products for the Home Craftsman" (free).

Casein Co. of America, 350 Madison Ave., New York, N. Y., "Gluing Jig Saw Puzzles"; "Casco Gluing Guide"; "Casco Glue Folder"; "Free Projects Folder"; "Casco Flexible Cement Folder"; "Home Workshop Handbook"; "Samples of Casco Glue"; (free); "How to Make Veneered Panels" (50 cents).

Celotex Corp., 919 N. Michigan Ave., Chicago, Ill., "Interiors That Speak of Charm and Comfort" (free).

Century Furniture Co., Grand Rapids, Mich., "Furniture" ($1.10).

Chicago Wheel & Mfg. Co., 1101 Monroe St., Chicago, Ill., "Pleasure and Profit With the Handee" (25 cents).

Cleveland Model & Supply Co., Inc., 4506 Lorain Ave., Cleveland, Ohio, "Catalog No. 8" (10 cents); "Model Making Methods," wall charts — 3 (free to teachers).

Clover Mfg. Co., Norwalk, Conn., "What Are the Various Coated Abrasives?"; "What Are Their Uses?" (free).

Albert Constantine & Son, Inc., 797 135th St., New York, N. Y., "Fine Cabinet Woods and Their Uses" (15 cents); "Fifty Varieties of Veneers" ($2.75).

Cowser & Co., Dallas, Tex., "38 Species of Common Woods" (free).

Craftsman Wood Service Co., 2727 Mary St., Chicago, Ill., "Hunt's Catalog No. 12 for Woodworkers" (10 cents).

Cyco Mfg. Co., Box 764, Davenport, Iowa, "Home Kraft Furniture" (10 cents).

Delta Mfg. Co., 600 E. Vienna Ave., Milwaukee, Wis., "Making Money with Delta Tools" (10 cents); "Getting the Most Out of Your Shaper" (25 cents); "Getting the Most Out of Your Band Saw" (25 cents); "Getting the Most Out of Your Drill Press" (25 cents); "Getting the Most Out of Your Lathe" (25 cents); "Getting the Most Out of Your Circular Saw and Jointer" 25 cents); "Project Books Nos. 2, 3, 4, and

5" (10 cents); "Planning for Home Workshops" (free).

Henry Disston & Sons, Inc., Philadelphia, Pa., Wall Charts (free); "Pruning Guide" (free); Sample copy of saw, tool, and file manual (free to teachers).

Douglas Plywood Association, Tacoma Bldg., Tacoma, Wash., "Plywood Progress" (10 cents); "Dri-Bilt with Plywood Manual" (free); "Portfolio of Architectural Plates" (free).

W. E. Dunn Mfg. Co., Holland, Mich., "Four Keys to Success" (free).

E. I. DuPont de Nemours & Co., Inc., Wilmington, Del., "Kinship of DuPont Products"; "Wonder World of Chemistry" (free).

Grand Rapids Fibre Cord Co., Dept. A, 609 Myrtle St., Grand Rapids, Mich., "Art Fibre Furniture Weaving."

Hamilton Mfg. Co., Two Rivers, Wis., "General Catalog No. 200" (free).

Home Craftsman Magazine, 115 Worth St., New York, N. Y., "One-Evening Projects" (50 cents).

Industrial Arts Cooperative Service, 519 W. 121st St., New York, N. Y., "Catalog — For Teachers More Ideas for Children More Opportunity" (10 cents).

Iowa State College, Ames, Iowa, "Objectives of Industrial Arts" (75 cents); "Test Questions in Industrial Arts Education" (75 cents); "Poems for Teachers of Industrial Arts Education" (75 cents); "Instruction Sheets in Industrial Arts Education" (75 cents); "Index to 2550 Books on Industrial Arts Education and Vocational Industrial Education" (75 cents); "Saws, Proverbs, and Maxims (15 cents); "Buyer's Guide" (35 cents); "Leisure-time Bibliography" (75 cents); "Guide to Metalworking Problems" (30 cents); "Guide to Woodworking Problems" (30 cents); "Fifty Full-Scale Drawings of Woodturning Problems" (35 cents); "Industrial Arts Education in 1960" (15 cents); "Research Problems and Methods in Industrial Arts Education" (60 cents); "Theses Pertaining to Industrial Arts Education" (20 cents); "Index to Shop Kinks" (75 cents).

Irwin Auger Bit Co., Wilmington, Ohio, "How-to Select, Use, and Care for Bits."

Johns-Manville Co., 22 E. 40th St., New York, N. Y., "Insulating Board Brochure" (free).

S. C. Johnson & Co., Inc., Racine, Wis., "Handbook of American Trees and Wood Finishing" (free).

Keystone Glue Co., Williamsport, Pa., "Glue Handbook" (25 cents).

Kliss Mfg. Co., Inc., Grand Rapids, Mich., "The Book of Projects" (50 cents).

Kuempel Chime Clock Co., Guttenberg, Iowa, "Twenty-four Common Wood Sizes" ($1); "Thirty Varieties of Mouldings" ($1); "The Design Book" (10 cents); "How Clocks Are Built for Pleasure and Profit" (10 cents); "Blue Prints for Building Grandfather Clocks" (25 cents); "Five Popular Desk and Mantle Clock-Case Drawings" (10 cents).

LePage's Adhesives, Dept. A, Gloucester, Mass., "Do's and Don'ts for Gluing" (free); "Sample Job Plan" (free); "Glue Facts Chart" (free).

Libbey-Owens-Ford Glass Co., Sales Dept., Toledo, Ohio, "Window Conditioning" (free); "Double Glazing" (free).

Lufkin Rule Co., Saginaw, Mich., "Handy General Catalog No. 12" (free).

Lux-Visel, Inc., Elkhart, Ind., "Samples of Metallic X-1" (50 cents).

Magnus Brush and Craft Materials, 24 Water St., Wakefield, Mass., "Electric Wood Etching" (free).

Mahogany Association, Inc., 75 E. Wacker Drive, Chicago, Ill., "How to Know Period Furniture."

Maple Flooring Manufacturers' Association, 332 South Michigan Ave., Chicago, Ill., "Color Harmony in Floors"; "Leaflet on Hard Maple Flooring" (free).

Masonite Corp., 111 W. Washington St., Chicago, Ill., "Literature on Products and Use in Home" (free).

David Maydole Tool Corp., Norwich, N. Y., "Captain of Industry" (free).

McCall Corp., 230 Park Ave., New York, N. Y., "Let's Talk About Dining Rooms"; "Let's Talk About Rugs and Carpeting"; "Let's Talk About Silverware"; "Let's Talk About Windows"; "Let's Talk About Painted Walls"; "Let's Talk About Home Lighting" (3 cents); "What To Do Book" (10 cents).

Minnesota Mining & Mfg. Co., St. Paul, Minn., "Sandpaper Is No Mystery"; "Faster and Better Finishes"; "Scotch Sandblast Stencil"; "Three M Tempered Garnet"; "You'll Save When You Use"; "The Better Finish Reflects"; "How to Do Refinishing in the Home"; "Elek-Tro-Cut Production Coated Abrasives"; "Wet or Dry"; "Scotch Fibre Tapes"; "Three M Floor Sanding Papers"; "Elek-Tro-Cut Ruff-Stuff"; "Scotch Cellulose Tape"; "Three M System for Appearance Reconditioning Automobiles"; "Catalog and Price List No. 36" (free).

J. H. Monheath Co., 202 Lewis St., New York, N. Y., "Story of Balsawood"; "Story of "Greenheart"; "Story of Teakwood"; "Story of Lignum Vitae" (free).

Monite Waterproof Glue Co., Minneapolis, Minn., "Crafts Manual and Trial Size Aircraft Glue" (25 cents); "Crafts-Manual" (25 cents); "Glue of the Ancients Gone Modern" (free).

National Manufacturing Co., Sterling, Ill., Wall Chart (free).

National Oak Flooring Manufacturers' Association, Inc., 830 Dermon Bldg., Memphis, Tenn., "Nature's Matchless Touch Etched the Beauty in Oak Floors"; "New Beauty for Old Homes in Hardwood Floors of Oak"; "How to Lay, Finish, and Care for Oak Floors" (free).

National Hardwood Lumber Association, 59 E. Van Buren St., Chicago, Ill., "Rules for Measurement and Inspection of Hardwood Lumber" (25 cents).

National Lumber Manufacturers' Association, 1337 Connecticut Ave., Washington, D. C., "Small Homes Demonstration Handbook" (20 cents); "For Home Lovers" (10 cents); "Soft Warm Beauty of Paneling" (free); "New Interior Ideas in Wood" (10 cents); "Wood Exterior Walls" (10 cents); "Wood Structural Design Data" (Vol. 1) ($1); "Stronger Frame Walls" (10 cents); "Light Frame House Construction" (40 cents); "Lumber Industry Book of Facts"; "Lumber Grade-Use Guide" ($1.50); "Lumber Inspector's Probe" (50 cents); "Standard Wood Mouldings" (30 cents); "Lumber" (30 cents); "Grading Rules"; "Exposing the Termite" (free); "Airplane Hangar Construction" (10 cents); "Airplane Hangar Fire Test Pictorial" (10 cents); "Wood in Aircraft Construction" ($1); "Lumber for Oil Industry Purposes" (10 cents); "Windows and Heating Costs"; "Why Wood Walls Are Best"; "Bearing Strength of Wood Under Bolts" (5 cents); "Caskets — When They Ask You About Caskets Made of Wood"; "Composite Trailer Sales Manual" (10 cents); "Story of Wood" (free); "Wood Samples" ($1.95 per set).

Needlecraft Publishing Co., Augusta, Me., "A-B-C Reedwork Book" (10 cents).

New York State College of Forestry, Syracuse, N. Y., "Atlas of Commercial Woods" (60 cents).

Nicholson File Co., Providence, R. I., Wall Charts (free); "File Filosophies" (free).

North Bros. Mfg. Co., Lehigh Ave. and American St., Philadelphia, Pa., "Yankee Tool Book" (free).

Northern Hemlock & Hardwood Manufacturers' Association, Oshkosh, Wis., "Home Interiors of Charm and Beauty"; "Some Things Home Builders Should Know About Lumber"; "Vital Factors of Building Construction"; "Comparative Physical Properties of Hardwoods"; "Selective Logging in Northern Hardwoods of the Lake States" (free).

Northwestern Lumbermen's Association, 1645 Hennipin Ave., Minneapolis, Minn., "What to Make With Wood and How" (10 cents).

Norton Co., Worcester, Mass., "Norton Lecture Course" (free).

New York State College of Agriculture, Cornell University, Ithaca, N. Y., "Refinishing Old Furniture," E-295 (4 cents); "Your Money's Worth in Furniture," E-297 (4 cents); "Selection and Arrangement of Furniture," J-50 (7 cents); "Homemade and Remodeled Furniture," J-51 (6 cents); "Window Treatment," J-52 (4 cents); "Clothes Closets and Their Equipment," J-53 (5 cents); "Smaller Furnishings for a Girl's Room," J-54 (5 cents).

Ohlen-Bishop Co., Columbus, Ohio, "Saw Efficiency" (free).

Oliver Machinery Co., Grand Rapids, Mich., "Installation, Care and Operation of Oliver Circular Saw Benches" (free); "Proper Installation and Care of Oliver Band Saws" (free); Wall Charts (free).

Pan American Union, Washington, D. C., "Marketing Problem of Tropical Hardwood-Exploitation Forestry 12" (5 cents); "Tropical Hardwoods and Their Uses in American Industries" (5 cents).

Frank Paxton Lumber Co., Kansas City, Kans., "Philippine Mahogany Circulars" (free); "Forty-two Wood Studies," sample set ($2.50).

H. H. Perkins Co., 256 Shelton Ave., New Haven, Conn., "Reedcraft" (free).

Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa., "Index and Directory of Glass Products" (free); "Glass, the Triumph of Chemistry" (free).

Popular Mechanics, 200 E. Ontario St., Chicago, Ill., "Build It Yourself Plans" (3 cents).

Porter-Cable Machine Co., Syracuse, N. Y., "Take-About Sander Abrasive Chart" (free).

Portland Cement Association, 33 W. Grand Ave., Chicago, Ill., "Practical Course in Concrete"; "Concrete Improvements Around the Home"; "Facts About Concrete Masonry" (free).

W. M. Ritter Lumber Co., Columbus, Ohio, "Ritter Oak Flooring" (free).

Rogers Isinglass and Glue Co., Gloucester, Mass., "Facts You Should Know" (free).

Red Cedar Shingle Bureau, Seattle, Wash., "Certigrade Handbook" (50 cents).

Russia Cement Co., Gloucester, Mass., "Glue Facts"; "Do's and Don'ts for Gluing" (free).

Savogran Co., India Wharf, Boston, Mass., "How to Repair and Refinish Furniture" (free).

Sargent & Co., P. O. Box 1940, New Haven, Conn., "Standard Steel Squares" (free).

Simonds Saw and Steel Co., Fitchburg, Mass., "Hacksaw-ology"; "How to File a Cross-Cut Saw"; "File Facts"; "Methods of Cutting Metal"; "Circular Saw"; "Care and Use of Circular Saws for Woodworking Plants" (free).

Skilsaw, Inc., 5031 Elsten Ave., Chicago, Ill., "How to Cut Costs on Small Homes" (free).

Soss Mfg. Co., Roselle, N. J., "What, A Hingeless Door?" (free).

Southern Cypress Mfg. Association, 722 Barnett National Bank Bldg., Jacksonville, Fla., "American Cypress and Its Uses," Trade Series No. 141, U. S. Dept. of Commerce (free); "Pecky Cypress — What It Is and How to Use It" (free); "Tideater Red Cypress for Interiors" (free); "How to Properly Paint Exterior Woodwork" (free); "Why Cypress is Resistant to Termites" (free); "Good Bungalows for Good Birds," working plans for birdhouses, (10 cents); "Current Grading Rules" (12 cents).

Southern Hardwood Producers, Inc., 600 Maritime Bldg., New Orleans, La., "Red and Sap Gum"; "Oak From Southern Hardwood Forests"; "Southern Hardwood Interiors"; "Tueplo and Black Gum"; "Southern Oak for Paneling and Interior Trim" (free).

Southern Pine Association, New Orleans, La., "Questions Before the House"; "Standard Specifications for Longleaf and Shortleaf Southern Pine Lumber and Timber: "Permanent Homes of Southern Pine"; "And Now Dry Lumber"; "Southern Pine Farm Buildings"; "Architects' Specifications Manual for Residences" (free).

Stanley Tools, New Britain, Conn., "Joy of Accomplishment Booklet"; "Expert Soldering Booklet"; "Stanley Tool Catalog"; "Steel Square Booklet" (free); "Tool Guide" (25 cents); "Plan Book — Fifteen Things to Make in Your Home Workshop" (10 cents); Sixteen wall cards, with 32 charts of tools ($1.50).

Texas Co., 133 E. 42nd St., New York, N. Y., "Lubrication of Woodworking Machinery" (free).

Thayer & Chandler, 910 Van Buren St., Chicago, Ill., "The Idea Book" (free).

Tile-Tex Co., Chicago Heights, Ill., "Floors That Endure" (free).

U. S. Department of Agriculture, Forest Service, Madison, Wis., R-1055, "Artificial Resin Glue for Plywood"; R-492, "Animal Glues, Manufacture, Testing, and Preparation"; R-281-2, "Blood Albumin Glues, Manufacture, Preparation, and Application"; R-280, "Casein Glues, Manufacture, Preparation, and Application"; R-30, "Vegetable (starch) Glues"; R-914, "Dry Glue Method of Laying Veneers"; R-1032, "Bending of Wood"; R-768, "Sap or Moisture Content of Wood"; R-736, "Shrinking and Swelling of Wood"; R-716, "Structure of Wood"; R-509, "Relation of Moisture Content and Drying Rate of Wood to Humidity of Atmosphere"; R-1073, "Effect of Extractive Substances in Certain Woods on Durability of Paint Coatings"; R-977, "Adhesion in the Painting and Gluing of Wood"; R-1011, "Testing House Paints for Durability"; R-1015, "Effect of Aluminum Priming Paint on Durability of House Paints on Wood"; R-935, "Study of Priming Coat Reductions for Painting New Wood Surfaces"; R-1064, "What Paint Salesmen Can Do to Prevent Paint Complaints"; R-962, "When and How to Paint Farm Buildings"; R-974, "Effectiveness of Paints as Protective Coatings for Wood"; R-6, "Some Causes of Blistering and Peeling of Paint on House Siding"; "Work of the U. S. Forest Service"; "Homes for Birds," No. 1456; "Food for Well Known Birds," No. 506; "Common Useful Birds," No. 630; "Common Game Birds," No. 497 (free); "Forest Trees of Pacific Slope" ($1).

U. S. Dept. of Agriculture, Office of Information, Washington, D. C., "Care and Improvement of Farm Woods," No. 1177; "Glue Plywood, and Coatings"; "Structure and Identification of Woods"; "Drying of Plywood Panels"; "Work of U. S. Forest Service" (free); "Key to Woods Used for Furniture" (25 cents).

U. S. Department of Commerce, Bureau of the Census, Washington, D. C., "Biennial Census of Manufacturers, 1933" ($1.25); "Biennial Census of Manufacturers, 1935" ($1.75).

U. S. Printing Office, Superintendent of Documents, Washington, D. C., "Simple Plumbing Repairs," Bull. No. 1460 (5 cents); "Farm Plumbing," Bull. No. 1426 (5 cents); "American Cypress and Its Uses"; "Leaflet Bibliography of Publication"; "Handy Books Price List"; "Guide Book for Identification of Woods" (30 cents); "How Public Forests Are Handled" (5 cents); "Timber, Mine or Crop" (15 cents); "Aviation in the Public Schools," Voc. Ed. Bull. No. 185 (15 cents). "Identification of Furniture Woods" (25 cents); "How Lumber is Graded" (10 cents); "Description of Common Woods Used in Furniture," No. 66 (25 cents); Kiln Drying Handbook," No. 1136 (30 cents); "Gluing of Wood" (25 cents); "Wood Handbook," (35 cents); "Trade and Industrial Education" (15 cents); "Effectiveness of Moisture Excluding Coating on Wood" (10 cents); "Comparative Strength Properties of Woods in United States" (5 cents); "Price List of Forestry Publications"; "American Hardwoods and Their Uses," No. 178 (15 cents); "American Pitch Pine and Its Uses," No. 119 (10 cents); "American Douglas Fir and Its Uses," No. 87 (10 cents); "American Douglas Fir Plywood and Its Uses," No. 167 (10 cents); "California Redwood and Its Uses," No. 171 (10 cents).

U. S. Dept. of Interior, Office of Education, Vocational Education, Washington, D. C., "List of Publications on Vocational Education."

Universal School of Handicrafts, Inc., 25th floor, RKO Bldg., Rockefeller Center, New York, N. Y., "Synthetic Amber Manual of Instructions"; "Manual on Nonfiring Clay" (25 cents); "Manual on Inner-Tube Toys" ($1); "Manual on Card Weaving" ($1).

Upholstery Supply Co., 1033 N. Fourth St., Milwaukee, Wis., "Catalog E" (free).

Walker-Turner Co., Inc., Plainfield, N. J., "The Lathe"; "The Band Saw"; "The Drill Press"; "The Bench Saw, Jointer, and Shaper" (free).

J. D. Wallace & Co., 134 S. California Ave., Chicago, Ill., "From the Master Cabinet Makers to Woodworking Machinery" (free); "Cardalog of Machines" (free).

Western Pine Association, Yeon Bldg., Portland, Oreg., "Wood Turning in the Home Workshop"; "Forest Conservation in the Western Pines"; "Wood Carving for Pleasure"; "Plan Book for the Boy Builder"; "Facts About Idaho Genuine White Pine"; "Facts About Sugar Pine"; "Facts About Ponderosa Pine" (free).

H. L. Wild, 510 E. 11th Street., New York, N. Y., "Scroll Saw Patterns"; "Jig Saw Picture Making" (25 cents).

Wood-Finishing Division

Adams & Elting Co., 1833 S. Norman Ave., Chicago, Ill., "Patching Furniture Finishes with Proper Materials."

Aluminum Co. of America, Pittsburgh, Pa., "Welding Aluminum"; "Riveting Aluminum"; "Machining Aluminum"; "Finishes for Aluminum"; "Aluminum Paint Manual" (free).

Boston Varnish Co., Everett Station, Boston, Mass., "Color Suggestions for Your Home" (free).

Chicago Tribune, Tribune Tower, Chicago, Ill., "Refinishing Furniture" (5 cents).

James B. Day & Co., 1872 Clybourn Ave., Chicago, Ill., "The Romance of Shellac" (free).

Department of Commerce, Bureau of Standards, Washington, D. C., "Outside House Painting"; "Paint, Varnishes, and Related Products."

E. I. DuPont de Nemours & Co., Inc., Wilmington, Del., "Kinship of DuPont Products"; "Wonder World of Chemistry" (free).

Grand Rapids Wood Finishing Co., Grand Rapids, Mich., "Better Wood Finishing" (free).

S. C. Johnson & Son, Inc., Racine, Wis., "Handbook of American Trees and Wood Finishing" (free).

Minnesota Mining & Mfg. Co., St. Paul, Minn., "Sandpaper is Not Mystery"; "Faster and Better Finishes"; "Scotch Sandblast Stencil"; "Three M Tempered Garnet"; "You'll Save When You Use"; "Better Finish Reflects"; "How to Do Refinishing in the Home"; "Elek-Tro-Cut Production Coated Abrasives"; "Wet or Dry"; "Scotch Fibre Tapes"; "Three M Floor Sanding Papers"; "Elek-Tro-Cut Ruff-Stuff"; "Scotch Cellulose Tape"; "Three M System for Appearance Reconditioning Automobiles"; "Catalog and Price List No. 36" (free).

National Lead Co., 900 W. 18th St., Chicago, Ill., "Handbook on Painting"; "Dutch Boy Calculator-Paint" (free).

National Paint, Varnish and Lacquer Association, Inc., 2201 New York Ave., N. W., Washington, D. C., "New Paint, Varnish, and Lacquer Catechism"; "Why Paint Peels" (free).

New York State College of Agriculture, Cornell University, Ithaca, New York, "Refinishing Old Furniture," E-295 (10 cents).

Pittsburgh Plate Glass Co., Grant Building, Pittsburgh, Pa., "Index and Directory of Glass Products"; "Glass, the Triumph of Chemistry" (free).

Savogran Company, India Wharf, Boston, Mass., "How to Repair and Refinish Furniture" (free).

Southern Cypress Mfg. Association, 722 Barnett National Bank Bldg., Jacksonville, Fla., "How to Properly Paint Exterior Woodwork" (free).

U. S. Dept. of Agriculture, Forest Service, Madison, Wis., "Artificial Resin Glue for Plywood," R-1055; "Animal Glues — Manufacture, Testing and Preparation," R-492; "Blood Albumin Glues — Manufacture, Preparation, and Application," R-281-2; "Casein Glues — Manufacture, Preparation,

and Application," R-280; "Vegetable (starch) Glues," R-30; "Dry Glue Method of Laying Veneers," R-914; "Bending of Wood," R-1032; "Sap or Moisture Content of Wood," R-768; "Shrinking and Swelling of Wood," R-736; "Structure of Wood," R-716; "Relation of Moisture Content and Drying Rate of Wood to Humidity of Atmosphere," R-509; "Effect of Extractive Substances in Certain Woods on Durability of Paint Coatings," R-1073; "Behavior of House Paints on Different Woods," R-1053; "Adhesion in Painting and Gluing of Wood," R-977; "Testing House Paints for Durability," R-1011; "Effect of Aluminum Priming Paint on Durability of House Paints on Wood." R-1015; "Study of Priming Coat Reductions for Painting New Wood Surfaces," R-935; "What Paint Salesmen Can Do to Prevent Paint Complaints," R-1064; "When and How to Paint Farm Buildings," R-962; "Effectiveness of Paints as Protective Coatings for Wood," R-974; "Some Causes of Blistering and Peeling of Paint on House Siding," R-6 (free).

Ivan D. Wood, University of Nebraska, Lincoln, Nebr., "Suggestions for Mixing and Applying Paints and Other Wall Finishes" (free).

Wooster Brush Co., Wooster, Ohio, "Which Brush Shall I Use Folder" (10 cents).

William Zinsser & Co., 516 W. 59th St., New York, N. Y., "Story of Shellac" (free).

Course of Study in Industrial-Arts Cabinetmaking—II

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This is the second part of the outline of study.

Antiques and Period Furniture

Of the Gothic furniture of the thirteenth, fourteenth, and fifteenth centuries, there is practically none in existence at the present time. The characteristic feature of Gothic furniture of the fifteenth century is the four-center arch. Comparatively few pieces of this furniture were made by the guild of cabinetmakers established by the provost of Paris in 1371 for the wealthy nobles. In each of the craft guilds there were three ranks, apprentice, journeyman, and masters, the last rank alone having the right to sell goods. The apprentice served six years, which included a year or two of traveling to the other countries. At the end of six years, the journeyman could apply to be a master. He then took an examination under the masters of the guild. While taking the examination, he was locked up in a workshop and given a complicated piece of furniture to execute. If his work proved satisfactory, he was allowed to become a master. He then took oath to offer nothing for sale but work of the highest quality. He was subject to a heavy fine, also expulsion from his guild, if he disobeyed these orders. The principal objects of the furniture in use at this period were stools, benches, chairs, credences, chests, tables, and beds.

During the Italian Renaissance Period, the designs included such items as the Greek feet, the egg and dart, tongue and dart, leaf and tongue, and egg and leaf motifs, various combinations of beads and finally the broad band of laurel. All these patterns are found everywhere in the moldings of the Renaissance architecture. Chests are the principal articles of furniture in this period from the fifteenth to sixteenth century. The wedding chest was an elaborate piece of furniture. The exact date of these can be determined by the study of the coat of arms carved on them. *Genuine Antique Furniture* by Arthur De Bles, Thomas Y. Crowell Co. Publishers, New York City, may be used as a reference on the foregoing:

Jacobean Period	1603 to 1688
Jacobean Period (proper)	1603 to 1649
Cromwellian Period	1649 to 1660
Carolean Period	1660 to 1688

Jacobean furniture is heavy and cumbersome and not suited for modern apartment houses. Articles in common use are chairs, forms, stools, settees, love seats, beds, tables, cabinets, and sideboards. The furniture was stout and stanch, severe in form and line and it possessed a superfluity of ornaments. Chairs and settees had high seats and heavy stretchers between the legs. The seats were square and the backs were high and perpendicular. About 1665 spiral turned legs came into much favor and were used for tables and other articles of furniture as well as for chairs. Up to the Restoration all the better chairs had been made of oak, but walnut now became generally available and lent itself more readily to delicate carving and turning. In the latter part of the Carolean times chairs, upholstered in handsome textures coming from the English looms, came into fashion. The processes of decoration ordinarily employed through the Jacobean, Cromwellian, and Carolean periods were carving, inlay, turning, painting, gilding, lacquering, upholstering, paneling, applied ornaments, and veneering.

William and Mary Period 1688–1702

This period was of short duration during which a market appreciation toward refinement and simplicity became evident. This, no doubt, was due to the influence of Queen Mary's Needlework which was used to upholster chairs, settees, and stools. Upholstering material by French textile workers, marquetry, beautiful decorations, gold oriental decorations, artistic coloring, and simplicity of form, rather than elaborate scrollwork give beauty to the product of this period, during which artisans held that grace of proportion was of more account than intricacy or dexterity of carving. It is at this date that the curvilinear element comes into vogue and is apparent in legs with inserted cup or spindle turnings, shaped stretchers, scrolled legs, or legs with Spanish feet, and the cabriole leg. It is the period of Grinling Gibbon, of lowboys, when walnut wood becomes popular, and furniture is finished in oil and wax.

Queen Anne and Early Georgian Period — 1702–1760

Distinguishing features: greater elaboration in carving, the chief motifs being more cockleshells, occasionally with pendent husks below them, distributed on the knees of chairs, settees, and tables and the backs and seat rails of chairs and settees. There also are vigorously carved claw and ball feet, and boldly executed eagle's heads to terminate the arms of chairs and settees. Popularization of mahogany for chairs and cabinet work was rapid from 1720 onward. Legs of furniture are now of cabriole type, and the cyma curve becomes an important element of form. Structure tends to become lighter. Cabriole-legged drop-leaf tables with club or claw and ball feet, made of walnut, oak, and mahogany, were the most commonly produced pieces of furniture.

Louis Quatorze and Louis Quinze 1643–1774

The structural lines in Louis Quatorze furniture were almost invariably perpendicular or horizontal while in furniture of the Louis Quinze period, the cabinetmakers preferred to curve their lines. Cabriole legs assumed stronger curves and stretchers disappeared. Boulle work, rococo ornament, brass ormolu, and other metal mounts were designed with the greatest care. The joinery was of a high degree of excellence in this period as it was in the succeeding period.

Chippendale — 1740–1779

Thomas Chippendale is often called the most famous of all the English cabinetmakers. He worked in the manner of the great masters before him, his own individuality being sufficiently strong to add all the originality that was needed. He added to every style, from which he drew, the qualities of sturdiness, grace, wonderful craftsmanship, and homelike character. Chippendale was a good businessman and advertiser and had a fashionable clientele. He was the first to interject personality into cabinetmaking, attaching his name inseparably to the output of his workrooms. *The Gentlemen and Cabinet Makers Directory* gave him a great reputation at that time. He died in 1779.

The cabriole, or bandy leg is a feature of Chippendale's work, as are also chairs with "fretted backs." Chippendale turned his hand both in design and execution to every ordinary article of furniture except sideboards. His best work was his treatment of chairs.

Mahogany was the wood mostly used. French models inspired the serpentine curves and bombe fronts which he used. Chippendale's versatility was expressed in four distinct phases. First the distinctly English phase; second, the Gothic and fretted phase; third, the Chinese phase; and fourth, the phase "in the French taste."

The structure of Chippendale's furniture was structurally honest, otherwise so much of it would not have remained in such a perfect state of preservation. The joints were mostly mortise and tenon, or dovetailed together.

The Brothers Adam — 1762–1792

Robert and James Adam were designers, both of architecture and of furniture. They were not craftsmen themselves. They went directly to the fountainhead for their inspiration and accurate detail, and brought into English mobiliary art a powerful infusion of classicism, mostly of the Italian type, pure and untainted by transmission through any intervening channels. The forms and motifs they introduced dominated the inspiration for nearly everything that was designed in England, either in architecture or furniture, during the remainder of the century. The Adam Brothers were four in number, Robert, James, John, and William — all architects. Robert was born in Kickcaldy. He published a large volume dedicated to King George III, illustrated with his own paintings, plans, and exploration of the ruins of Spaltro. He was appointed architect to the King and went to Parliament. His brother James was also appointed architect to the King and succeeded his brother. They published *Works in Architecture of Robert and James Adams, Esquires.* This book was also devoted to designs and sconces, bookcases, mirrors, consoles, chairs, lamps, clocks, and other articles of furniture. They banished ponderosity and substituted lightness and grace. Their furniture is distinguished by beautiful and refined proportion, and by the clever selection and application of cultural ornament. There was no exquisite decoration in art that Robert and James Adam did not apply to the making of beautiful furniture, and posterity owes them a debt of gratitude for the heritage of grace and beauty they left behind them.

In contour the style struck an entirely new note; the curving structural lines were practically dropped and the rectilinear element or the angular element, again became supreme. All furniture became brighter and more graceful in character.

George Hepplewhite — 1765–1786

Little is known about the personal history of George Hepplewhite. He conducted his business in the parish of St. Giles, Cripplegate, and died in 1786. His style came through the French Channel of the Louis Seize style, which affected both form and detail. His great and lasting popularity and his influence on the furniture designs of our own day, is probably attributable to the fact that in addition to the grace and lightness of his creations, he always showed a thorough, practical, and English intention in whatever he made, although so many of the additional embellishments were borrowed directly from Louis Seize originals. Mahogany was mostly used but the Hepplewhite style has always been properly regarded as the real pioneer exponent of the values of lighter ornamental woods for cabinetwork, and the credit for their prevalence must be given to him. The whole Hepplewhite influence was for grace, lightness, and beauty of contour. His furniture developed a sense of freedom and buoyancy that never existed before, and this same spirit has given us some of our choicest heirlooms. Hepplewhite is regarded as the exponent of the curve.

The decorative processes used by Hepplewhite were as follows: painting, inlay, and marquetry, carving, turning, gilding, japaning, and veneering. His motifs include all the classic ones introduced by the Brothers Adam. In structure his furniture was superior to theirs. His carcase work was mainly rectilinear, with the exception of the shaped fronts of cabinets, chests, drawers, and sideboards.

Louis Seize — 1774–1793

In the Louis Seize period there was a noticeable return to rectilinear principles in the design of furniture, vertical and horizontal lines were emphasized; the legs of tables, sofas, stools, and cabinets were almost altogether straight. Had it not been for the grace of well-placed embellishments, not a little of the furniture might have been open to the charge of angularity. As it was, however, ornament was so adroitly disposed that it enhanced the classic purity of structural lines without the loss of distinction resulting from superfluity. The familiar French method of polishing with shellac was mainly used to impart a high and lasting finish to the woodwork not adorned with paint or lacquer.

Thomas Sheraton — 1780–1806

Thomas Sheraton was born in Stockton-on-Tees in 1750 and moved to London in 1790. He died there in 1806. He was a cabinetmaker and carver by trade. He was considered a designer more than a cabinetmaker, but that he was a fine craftsman is shown by the directions which he laid down in the pages of the *Drawing Book* which he published. This book was first published in 1791 and again in 1793 and 1802. The *Cabinet Makers Dictionary* followed in 1803. He was the last of the furniture designers of the eighteenth century and lived to see all the beauty vanish from English furniture in the deluge of vulgar ugliness and banality that poured in as a consequence of aping the French Empire styles, a source of inspiration not to be commended at its best.

In his ideals and consistent fidelity to the sources of his best inspirations, Sheraton was more of a classicist than Hepplewhite while his admiration for geometrical forms and principles made him anticipate in a sane, agreeable way, the ultramodern cubistic tendency in furniture designing exemplified in some of the recent German styles. He drew most copiously from the classic Renaissance forms as presented in the Louis Seize style. His furniture had a remarkable sense of dignity and refinement, and its delicacy of outline and detail made it eminently fit for reception rooms, boudoirs, and small salons, where it might well take the place of the modern adaptions of Louis Seize furniture so greatly overdone at present.

Other Furniture Makers and Designers

Sir William Chambers was born in Sweden in 1726. He published a book in 1757, which was embellished with numerous engravings, describing what he had seen on his travels abroad. He treated the whole aspect of Chinese decoration exhaustively and may be regarded as the sponsor of the Chinese vogue in England. He was one of our very earliest writers on interior decoration.

Ince and Mayhew were London cabinetmakers. They published a book, *Universal System of Household Furniture.* This work is unconvincing and patently copied from Chippendale's less inspired models. They were pirates, ignorant of the principles of design and their creations were vulgar, grotesque, and weak. Other furniture makers at this time were Copeland, Lock and Johnson. Their performances were far from the standards of excellence set by Chippendale and his greater contemporaries. Thomas Shearer was a contemporary of Hepplewhite and Sheraton, and of all the lesser lights in the furniture

world of the eighteenth century seems most entitled to our admiration and respect. His work was similar to that of Hepplewhite and Sheraton.

The Empire Period — 1793–1830

Of all the styles developed in France that of the Empire period is the least interesting and least French. It lacks refinement and spirituality. The prevailing tone is drearily artificial and contrasted with the period of Louis XVI style, is appallingly brutal and vulgar, and shows the grandiose brutality of Imperial Rome. The leading French artists were Percier, Fontaine, and Daird. The work of the cabinetmaker descended at times to shocking depths of banality or pompous ugliness.

American Period — 1795–1830

Patterned after the French type of architecture due to the cordial dislike of all things English at that time, American Empire furniture is of various degrees of merit in great measure corresponding to the date of manufacture. Its last stages were clumsy and graceless in the extreme, with large vulgar and meaningless scrolls highly suggestive of the convolutions of squirming fat earthworms. The bulk of the furniture between these extremes had much to commend it. The deep rich coloring of the mahogany relieved by the brass mounts made a very impressive and agreeable contrast. Not a little of the carving was vigorous in conception and excellent in execution. The one man to whom much of its redeeming qualities are due is Duncan Phyfe, a New York cabinetmaker who has often been called the American Sheraton. He possessed a remarkable sense of proportion and was endowed with excellent taste, so that the furniture he designed redeemed much of the bald ugliness and clumsy ponderosity of some of the other work produced in great quantity. The American Empire sideboards are among the best pieces of furniture that the period produced, both in structure and design.

Other American Furniture

Copied and patterned after that produced in the old country, there is practically no difference in detail or structure between the British pieces and those made in the Colonies. The chair work executed in Philadelphia quite equaled the best that was done in England.

In New England the character of furniture was Jacobean in type. All the New England furniture combined simplicity with fascinating grace of lines giving it a permanent artistic value.

In New York and Long Island both English and Dutch influences were felt. The earliest furniture was entirely Dutch in type, but later New York became thoroughly English in culture and tastes.

In Philadelphia and Pennsylvania, where the Friends and the Quakers lived, the furniture was mostly of William and Mary type. It was largely made of black walnut, a beautiful wood growing along the banks of the Schuylkill river. From the middle of the eighteenth century onward, the Philadelphia cabinetmakers ranked first of their craft in America, and they were the peers of their fellow artisans in London.

Virginia and Maryland and the Carolines imported their furniture from England or from Philadelphia, and therefore, developed little or no furniture of local character.

(To be continued)

Industrial Arts in English Schools

Reginald A. Ivy

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How the shop teachers in England solve their problem.

To walk into a woodshop where the only machines are a small foot-treadle jig saw and a hand-cranked grindstone would be an unusual experience for the average industrial-arts instructor in any large city in this country, but it seems to be rather usual in the schools of London, England.

The emphasis apparently is on handwork along cultural lines, with objectives similar to those in the average seventh- and eighth-grade classes here. The remark an instructor made while we both watched a small Londoner cut a bridle joint, "A boy simply must be honest with himself in the work," indicates in part the philosophy behind the English craftwork. The English maintain a higher standard of workmanship than we do with boys of a given age level. An important factor to be considered in this, however, is the size of the classes, which are very sanely limited to a group of twenty in which are no mixed grades. The exercise piece still plays an important part in the woodshop curriculum. Planing wide stock to definite widths, sawing to a series of lines, cutting several dadoes on the one piece, are all part of exercise pieces which must be completed by beginners.

In the projects made (book racks; book ends; knife and fork boxes; trays; trinket boxes; hat and coat racks, with mirror; end and night tables, etc.), are embodied the various joints of the wood and cabinet craft. It was surprising to see the ends and sides of the knife and fork box hand dovetailed. To help British trade and industry, "Empire" lumber from the colonies is used wherever possible. To see Australian walnut, a mean, tough, cross-grained lumber which is practically impossible to plane except across grain, being worked up and shaped into beautifully made cabinets, calls for open admiration. The more common softwoods, poplar (American white wood) pine (*deal* to them), etc., are, of course, also used. Generally speaking the lumber is inferior to what we are accustomed to. Most of it seemed to be rough stock that had to be planed to size with the old-style wood planes. Observing these in general use prompted the question whether it was the cost or conservatism that kept these planes in the school. The answer indicated the latter. In one shop visited, a highly treasured tool was a steel plane, the only one of its kind in the shop. An interesting feature is the periodic visits of the tool repairman to sharpen and set saws and make general minor repairs.

The drawing is done at the workbench in a special drawing book. The drawing consists of a working drawing of the projects to be made, in the third angle, although there is a tendency in industry to favor the simpler first angle.

A small amount of metalwork is also given. This is more along art-craft lines and consists of small handmade escutcheons, box corners, decorative hinges and handles, etc.

There was little evidence of job sheets, wall charts or textbooks, in general use. Apparently they are not so fortunate as we in having such a rich store of printed material available. An academic instructor with whom I discussed the matter expressed great admiration for the American textbooks in general.

A four-year course at the Shoreditch Training College is required of those who wish to qualify as woodwork instructors. The usual academic subjects are also required of these teachers. On entrance to the course, the future teacher buys a kit of tools which also includes some for metalwork.

The projects in woodwork throughout the four-year course are entirely handmade, and in view of the fact that the emphasis is on handwork and that the shops where the student teachers will eventually teach are not machine equipped, it seems fairly logical to disregard the machine. This applies to the industrial-arts type of shop only.

The first-year shopwork is mostly consumed with constructing the various types of joints in wood- and cabinetwork, after

which projects are assigned in which individual treatment in design, balance, and proportion are encouraged and constructively criticized.

Visits are made to museum and old country houses to study period styles and designs.

In the final year, the student teacher must design and construct a project of his own. It was a decided pleasure to walk through the exhibit hall in which were displayed buffets, desks, tables, bedroom suites, and bookcases of every description, and enjoy the exquisite workmanship and harmony in design of these embryo instructors.

A three-hour examination piece in the woodshop which involved in part (so far as my memory serves) construction of the stopped dovetail, half-lap, mortise-and-tenon joints, was just completed and in looking them over, I wondered how many of us would relish a similar test of our skill in craftsmanship.

An interesting feature of the Shoreditch College is the course for *masters' sons* (i.e., those whose fathers own and operate a commercial cabinet shop) who are taking this work to fit them to take over their fathers' business at some future time.

Another point of interest was the geographic location of the trade schools. The majority of commercial cabinet shops, for instance, are located in the east end of London. Hence, the cabinet trade school is located there. Also, similarly the trade school for butchers and meat cutters is located near the famous Smithfield Meat Market.

In such a brief visit, a detailed description of the school system of London County Council Schools is not possible, but the setup does not seem as truly democratic as ours, where almost every boy or girl has the opportunity to attend high school. In London certain scholastic requirements are required to enter the secondary or central schools (from the elementary schools) where further education is given to the age of sixteen. Otherwise, the educational career is cut short at the age of fifteen with, however, the opportunity to continue classes (mostly of a vocational nature) at evening school. It is interesting to note that provision is made in the curriculum for those boys who are not interested in the formal academic studies and to quote H. G. Stead in *Education in a Changing World:*

"All this is not a case of soft options, or a dodging of difficulties. Many children can express themselves in wood, metal, or colour when they fail to do so in words. Neither is the case that less intelligent children academically are better craftsmen. To hold such a view is to libel all good craftsmen. Craft-work demands skill in planning, a knowledge of the properties of various media, and executive ability. These are desirable qualities to develop in any child. The fact is that there is an increasing recognition of the facts that there is more than one approach to knowledge, and that because we have followed one it is not to be held that that is the only possible one. The new senior schools have eliminated the 'hooligan' type; they have found outlets for energy untapped before, and — they are still in an experimental stage. They promise much for the future. Most important of all, they may give the country an educated democracy in place of a mass instructed populace."

Coeducation is not so popular; several schools had the boys and girls segregated in their respective buildings with teachers of their own sex.

The English boy is greatly interested in America and the questions they asked indicated that the American films were one of their chief sources of information. Some of their queries concerned G-men, border patrol, gangsters, speed limits, airplanes, apartment houses, and the like.

Vocational Opportunities in Aviation

John Rogers

Putnam, Connecticut

A list of occupations found open to interested workers in the field of aviation.

Changes in industrial and social life are placing many problems and difficulties upon the populace. Unemployment, heading the list, is a matter of concern for all, and there is evidence that aviation will be a factor in the solution of this problem. The history of industry in our country almost gives an answer to this problem. Advances through inventions in the field of communication have been a vital factor in the industrial development of America. Improvements in manufacturing processes — so-called technological developments — have continually released labor from the established industries. Fortunately, in the past much of this labor was absorbed in new industries, a great part of which affected communications. The development of the railroads, making all parts of the country readily accessible, the Victrola recording the spoken word, the telegraph and telephone, the radio, all these industries affecting communications became vital factors in our social life and likewise absorbed great numbers of our people in productive pursuits. Aviation is now well on its way to take its place among the other great industries affecting communications, and undoubtedly, with its developments, since it is now only in its infancy, will absorb more and more of our industrial workers.

More than half a million men, women, and children a year make use of air lines in the United States for pleasure and business journeys. Mail and merchandise travel on scheduled air routes. The airplane is used for map surveying, for agriculture projects, for fire and police protection, and scores of special tasks calling for fast transportation.

The American public was not forcibly impressed with the possibilities of civil aeronautics until the summer of 1927. At that particular time flying was an art many years old, lighter-than-air craft and balloons having a much longer history. Air mail was being flown every day with little night flying and passengers carried on a few scheduled air lines. However, to the major population, flying was still a spectacle. A series of spectacular flights by Lindbergh in 1927 gave the final stimulus which established public confidence in the future of aeronautics as an industry.

This enthusiasm prompted people to inquire and investigate into other phases of aeronautics. Many new companies were formed overnight which resulted in more enterprises than were necessary. This necessitated reorganization; corporations were bought or merged until the industry is now composed of a few strong well-backed groups.

Flying as it is known today began on December 17, 1903. Orville and Wilbur Wright launched a biplane from a starting rail at Kitty Hawk, N. C. The plane made three flights, increasing the distance each time and landing safely. Glen H. Curtiss, after many years of study and experimentation, perfected the first hydroaeroplane a few years later. Europeans at this time were also building and flying airplanes, the major portion for experimental and exhibition purposes. Traveling flying exhibitions in America dated from 1909. At this time, too, some efforts were made to use the airplane for commercial projects, but these were not taken seriously until after the war.

In 1908, the United States War Department purchased the first military plane in the world. However, in European countries the military demand exceeded the civil demand until 1917. When the United States entered the war, it found the central powers not only using the airplane for military purposes, but also competing in construction and flying. By the end of the war,

the United States had built nearly 17,000 planes, trained some 10,000 men to fly, and instructed thousands of mechanics to construct and repair aircraft. Many pilots returned to their former callings and others continued flying, thus forming our first corps of civil aviators, touring the country on flying exhibitions. From this they developed the business of barnstorming, giving instruction to students, aerial photography, and many emergencies calling for speed. Civil aeronautics took its first important step in 1918, when the first air-mail line was inaugurated. This marked the beginning of scheduled air transportation in this country.

The public seems to think in terms of the plane which flies overhead. Aviation not only affects transportation; it affects the distribution field through sales of planes, parts and engines. It increases business activity through the sale of aeronautical materials. This increased business activity is evidenced from statistics compiled from the manufacture of instruments and accessories, including parachutes, radios, sales of fuel and oil, and the like. Aviation already represents a commercial activity of more than $100,000,000 per year.

The range of possible activities in aviation is wide, and careful study is necessary when seeking employment in the aeronautics industry. Personal inclination and talent are important factors, but the possibility of employment after training is a deciding factor. Previous experience in another field is valuable in one's preparation. For example, a worker who has learned welding will find opportunities in an aircraft factory. In view of the great public interest in flying during the past years, many young men and women have been attracted to seek employment in this field. Competition is keen and the positions go to those with unusual qualifications.

Positions available on scheduled air lines are:

Pilots and co-pilots — Radio operators
Stewards and hostesses — Dispatchers
Meteorologists — Operations managers
Airplane mechanics — Engine mechanics
Radio engineers — Radio mechanics
Instrument technicians and repairmen
Maintenance superintendents
Aircraft and engine engineers — Traffic agents

Positions available in miscellaneous flying operations are: Miscellaneous operations which include charter and sight-seeing activities, instruction of students, aircraft sales and servicing, crop dusting, smoke writing, etc.

Airplane and engine mechanics — Pilots
Parachute riggers — Flying instructors
Instrument repairmen — Aerial photographers
Salesmen and demonstrators
Airport engineers — Airport managers
Airport ground men, helpers
Ground-school instructors

Positions available in manufacturing:

Aeronautical engineers — Salesmen (pilots)
Test pilots — Draftsmen
Skilled workers, welders, woodworkers, sheet-metal workers, machinists, assemblymen
Helpers in the above trades

Qualifications for various positions are:

A pilot flying interstate air-passenger lines must meet strict and exacting regulations. He must show his skill in cross-country and night flying; fly entirely by instruments; shall have had at least 1,200 hours solo flying time, acquired within 8 years previous to date of application for the rating — 500 hours of this must be in cross-country flying; 75 hours or more of night flying, half of which must be over lighted airways.

Radio operators must have a federal license for operations. Their work may be on the ground or in some cases aboard the aircraft. A thorough knowledge of radio and its function is essential.

Dispatcher must have the ability to interpret and make weather maps; demonstrate his ability to make sound decisions in clearing planes for their schedules or canceling flights.

Meteorologists should have a knowledge of co-ordinating weather data and drawing up forecasts covering the route; accuracy in interpreting weather reports and predicting trends is essential.

Operations manager, usually an experienced pilot demonstrating the ability to direct the movement of planes from one terminal to another.

Airplane and engine mechanics must have a practical knowledge of airplane and engine maintenance and repair; and are required to hold a Department of Commerce license.

Radio engineers and mechanics are required to have a thorough grounding in the theory of radio and practical experience in radio communication.

Instrument technicians and repairmen. Experience in watchmaker's trade is usually the background for an instrument man. However any good mechanic can, after a short training period, become efficient in servicing aircraft instruments.

Parachute rigger must be licensed by the Department of Commerce and show his ability to pack and make minor repairs to parachutes.

Draftsmen should be men skilled in the field of mechanical drawing who can easily adjust themselves to needs in aeronautical drafting.

Skilled workers. It has been found that workers in industrial trades can adapt themselves to the needs of aircraft work. However, it is necessary to conduct a training class before permitting the men to engage in actual work as the requirements in aircraft are more exacting and strict.

Helpers, by attempting various tasks, can find what they are best fitted to do and develop their capabilities along the lines indicated.

Women in aviation. Opportunities for women in aviation are not lacking. For many positions men and women are equally acceptable. However, the young woman desiring to enter the field of aeronautics should carefully consider the obstacles she will encounter simply because of her sex. Whether this preference is justifiable or not, the fact remains that it exists.

Positions available for women in aviation:

Flying instructors (instructing women students)
Saleswomen at aviation schools
Airline hostesses
Air-travel advisers
Aeronautical promoters
Factory workers: sewing fabric, welders, making parachutes

In general, it may be said that there are three ways for becoming affiliated with the aviation industry: breaking into a trade, transfer from related trades, and organized training.

Breaking into a trade, or perhaps what is more commonly known as "stealing trades," is done by the individual who comes to the job inexperienced and untrained. By watching others at work and asking questions he learns as much as possible. The mechanic who has picked up his trade is at a disadvantage as compared with the mechanic who has received instruction based on a carefully worked out course of study given under the direction of a skilled and well-informed aviation mechanic who is also a trained instructor.

Entering aviation trades by transfer from related trades is not so satisfactory as entering from an efficient training period. Manufacturers have, however, been able to secure satisfactory employees and this method has enabled many to secure positions in the aircraft industry. Many men have found it necessary to secure only a small amount of additional training and experience in order to transfer from related trades to aviation. This will tend to create specialty men and as has been known, when companies are forced to reduce their staff, the one-trade man is dropped. Under such conditions, it is of vital importance that one becomes thoroughly trained in the basic fundamentals of aviation.

The most satisfactory way, therefore, is to take some form of organized training — evening, part-time, or trade preparatory. The knowledge and skill acquired through the completion of such training is an assurance to the employer that the mechanic can do certain jobs intelligently, accurately and at a desirable speed.

Learning A Trade by Teaching It

G. S. Wall

General Shops Department,
The William Hood Dunwoody Institute,
Minneapolis, Minnesota

Students of a trade learn a great deal about the trade they are learning, if it is necessary for them from time to time to explain it to someone else. The necessity for analysis and reasoning makes this possible.

This is true also for the teacher of trade subjects, and, incidentally, of any teaching. It is this aspect, the fact that the trade teacher has to analyze and organize the fundamentals of the trade, that prompts the quite common statement of many tradesmen who become teachers, "I learned more the first year of teaching my trade than I learned in several years in the trade." The professional teacher, whether shop or academic, can and does say the same. Obviously this would be and is true of the advanced trade-school student who is put into the role of teacher.

Dunwoody Industrial Institute has incorporated in its training program, work which gives the students a better opportunity to learn their chosen trade. During the last two months of the training course, the student is assigned one-half day to act as a foreman (in training) in the shop of his trade or one related to it. The fact that a foreman in a shop is a teacher to a degree, completes our analogy.

This student-foreman-training program is set up primarily to give students experience of this nature, not to provide an assistant to aid the instructor in charge of the shop. Lest some readers think of this as exploitation of the students, the statements of some instructors will quickly allay that impression. Some have said, "Having one or two foreman-training students in the shop, simply adds to one's work and worries." The duties of these foreman-training students include checking and ordering supplies, keeping records, assisting students, and in general acquainting themselves with shop organization and procedure. In addition they report to a class for foreman-training students for discussion of the problems which confront the foreman. They also are required to fill out reports showing that they have studied and noted certain organization details.

More specifically, the student-foreman-training classwork outline includes the following topics:

First month. (1) Shop procedure in the assigned shop; (2) tool systems; (3) handling and storage of supplies and materials; (4) assembly and storage of jobs; (5) selection and installation of equipment; (6) maintenance; (7) records and reports; (8) attitudes.

Second month. (1) The foreman as the key man; (2) cost of production; (3) the foreman as a leader; (4) the foreman as a selector of workers; (5) the foreman as a trainer of workers; (6) the foreman of the future.

Along with class discussions and study of these topics are definite assignments based on the shop in which the student is acting as a foreman.

In addition to this, the organization of Dunwoody and the slogan of "Any student, anywhere, at any time" bring about rapid shifts, both upward and downward, in the enrollment. Although a quite complete roster of call staff instructors is available, it is necessary at times to take on graduate or near-graduate students as assistant instructors. Naturally, the more mature and better students, some with previous trade experience, are selected. Despite this selection, the students generally gain not only financially but also in breadth of trade training, and in knowledge pertaining to the handling of men. As one such assistant put it, "I thought I knew quite a little about my trade but teaching others, even beginners, showed me how little I knew. In the last couple of months I had to learn a lot of things and besides I got to see the value of many things which I thought were of little or no value. Teaching a trade forces one to learn the trade."

Radio As a Part of Industrial Arts

Ira Bivans

Rock Falls, Illinois

Radio, in the minds of the majority of people is interesting, but only a few have the desire and determination to study it so as to talk intelligently on the subject. They think it is too difficult.

With the great number of radios throughout the world, the increasing number of educational programs on the air, the increasing popularity of sound projection machines in schools, and the increasing number of "hams," it is high time that an elementary course in radio be placed into the curriculum of the public-school system.

The following interesting facts were collected during the high-school conference in November, 1937, at the University of Illinois. A questionnaire containing the following questions was presented to sixty experienced industrial-arts teachers. The answers in per cent are also shown.

1. Do you think a simplified course in radio would be interesting to the boy? Yes *96* No *4*
2. Should radio be a part of the industrial-arts curriculum? Yes *83* No *17*
3. Are you qualified to teach radio? Yes *21* No *79*
4. Should industrial-arts teachers start preparing themselves to teach radio? Yes *79* No *21*
5. Would you like to have a text, with a minimum amount of theory, explaining step by step the practical side of radio and furnishing plenty of exercises? Yes *84* No *16*
6. Do you know of a public school where radio is offered? Yes *27* No *73*

This simply shows that in spite of the fact that radio is interesting to the boy, very little is being taught because few men are qualified, and there is not now a text on the market that deals with radio in terms of a beginner. The usual radio text can hardly be followed by the average instructor; how then is the boy to follow it and retain his interest? The textbook that is needed must deal with the practical side of radio, leaving out the uninteresting theory. It must be a book that the boy will enjoy.

While classifying the boys last fall, the writer asked this question: "Would you like to belong to a radio club?" Every boy answered "Yes." Such a club was started, and several one- and two-tube sets, both battery and electric, were made. Only one boy in the class knew the names of a few radio parts at the beginning of the year, while the remainder knew nothing about the subject. These same boys are now able to read wiring diagrams and build sets at home. A radio-parts catalog means something to them, and they are able to make out an order for any particular set.

While radio has been introduced in schools in science classes and in clubs, few regular radio courses are offered. There is a future in the field of radio, and industrial-arts teachers ought to interest themselves in the subject.

Problems and Projects

FISHING REEL

W. A. DeVette, Technical High School, Erie, Pennsylvania

(See illustration on page 289)

What all-round project can be found in which a greater number of boys will find an interest than a practical fishing reel?

Here is one that will be of triple service in addition to its usefulness after completion. It offers a project that can be used in the drafting room, pattern shop, and machine shop, particularly on the vocational-school level. It has a high instructional value in return for a small outlay for material and will find a ready sale among the students.

As a drafting problem it may be used for machine detailing and assembly drawing. It involves good practice in matching arcs, the use of the irregular curve, and the adjustable-head T square and a practical use for finish marks and running fits which the drafting students, without machine-shop experience, can appreciate.

In the pattern shop, it offers a fine example of the use of the dry-sand match and the use of a ring core box. The comparatively thin sections make this method of molding preferable over the split pattern.

For use in the machine shop, it offers a good introduction to the use of jigs and fixtures on a production basis.

This will require an operation layout and return to the drafting room for the design of jigs and fixtures to suit the machines available in the machine shop. These fixtures will then give additional work to the shop.

A project of this type is of much greater value than the usual standard exercise project.

ELECTRICAL SOLDERING IRON

Otto A. Northquest, Public School, Milwaukee, Wisconsin

The electric soldering iron described here is a project made by boys in the ninth grade enrolled in our industrial-mechanics classes. It combines the wood, metal, and electrical units in our shop. The boys have previously had work in woodwork and electricity.

The iron itself has many features not found in most irons made in school shops. First, it is so constructed that points may be changed very easily. Second, the assembly is not complicated. Third, units may be replaced with a minimum of work. Fourth, it is inexpensive to make; the cost does not exceed 70 cents, and when finished it has the appearance of a well-made iron. Then, too, using a unit that has been approved by the National Board of Fire Underwriters, eliminates the danger of violating a code.

Begin by making the copper point. It has been found that a ½-in. point works very well. If a ½-in. point is wanted, turn the threaded end down to ⅜-in. diameter, and then cut the threads. Or, just turn the end to ⅜-in. diameter, and slip it into the collar and let the brass screw hold the assembly together.

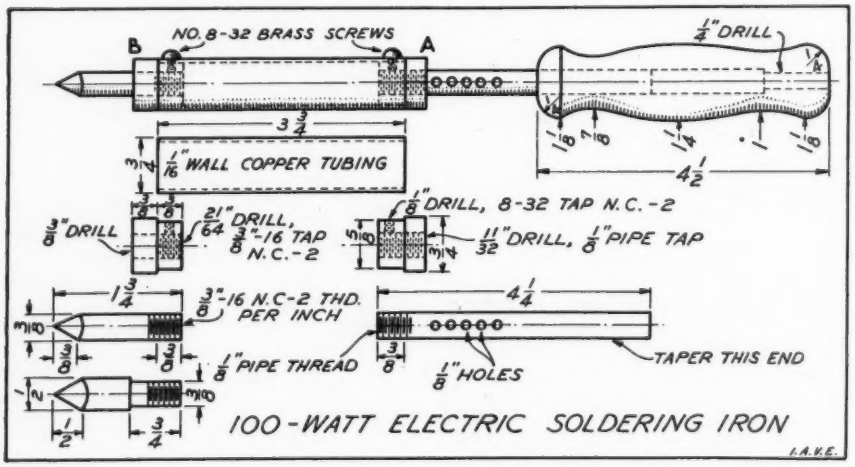
The ⅛-in. pipe is then made. Thread the end of iron pipe before cutting it to length. Drill the holes and then file the end slightly tapered so that the handle will fit tightly. This part may then be blackened if desired.

Next turn the bushings. If several are to be made, lay them out and turn from one piece of brass; then separate and finish machining. When fitting the bushings into the tube, have the bushing *A* a *force fit*, and bushing *B* a *slide fit*. To fit bushing *A*, file the end slightly tapered until the tube slides on about 3/16 in. Then put the tube and the bushing in the vise and force the bushing into place. This insures a very tight fit. The bushing *B* must be fitted so that it can be removed in case a new unit is to be installed. After the bushings are properly fitted, drill the holes for the brass screws while the assemblage is together. Then drill the brass tube 5/32 in. so that the screws will go through easily.

The wooden handles are turned on a wood lathe. Several handles may be made at one time if so desired.

The heating unit is porcelain of 100-watt capacity. It is ½ in. in diameter and 3¾ in. in length, with the outlets coming out of the end. These outlet wires are asbestos covered. The wiring of the iron is no more difficult than that encountered in wiring a lamp. To keep the unit from rattling and to keep the heat in, put a wrapping of asbestos paper around it. This type of unit may be obtained from electrical supply dealers. If difficulty is encountered in getting a unit of this type, just address a card to the author and information will be given.

The wire consists of 6 ft. of regulation asbestos-covered cord with a suitable cap attached.



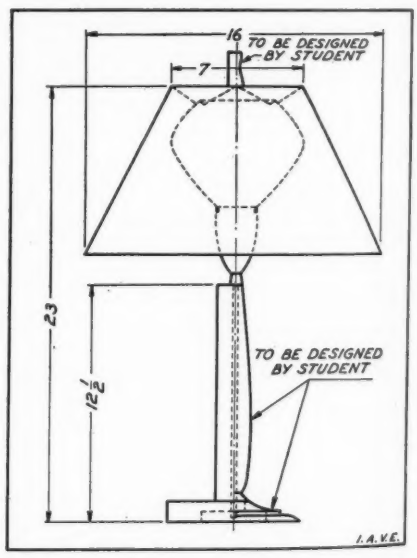
MAKING I.E.S. SIGHTSAVING LAMPS

Ethel Quaintance, Cleveland, Ohio

Boys in industrial-arts classes may now make lamps based on the sightsaving specifications worked out by the national professional group of lighting engineers and scientists, known as the Illuminating Engineering Society.

These specifications are used by some 60 manufacturers in the country to make the "I.E.S. Better Sight Lamps." Lighting engineers consider that these specifications provide the best possible reading light for students as well as for adults.

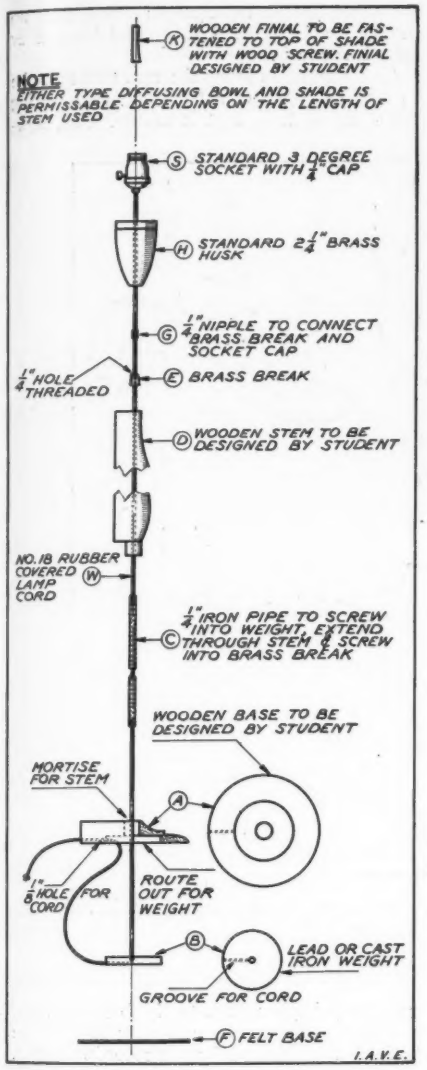
In and around Wheeling, W. Va., the specifications have been adopted in the industrial-arts classes of eight schools, and the students in these shops have made scores of beautifully marked and carved wood stems and bases which equipped with inner diffusing bowls and shades, find their way into the homes of the boys and their friends to provide better illumination.



The project was suggested to the schools by the Wheeling Electric Company, in the belief that students would enjoy making and using lamps that conform to scientific specifications which aim to give: (1) Sightsaving lighting; (2) good mechanical construction; (3) electrical safety.

To help in following these specifications, all lamp parts except base and outer stem were secured from an I.E.S. lamp manufacturer and purchased by the boys. These parts are available in prices varying from $1.65 to $2.20 each, F.O.B., in lots of 100.*

*For name of manufacturers please write Industrial-Arts Service Bureau, Bruce Publishing Co., Milwaukee, Wis.


WOODEN FINIAL TO BE FASTENED TO TOP OF SHADE WITH WOOD SCREW. FINIAL DESIGNED BY STUDENT
NOTE
EITHER TYPE DIFFUSING BOWL AND SHADE IS PERMISSABLE DEPENDING ON THE LENGTH OF STEM USED
STANDARD 3 DEGREE SOCKET WITH 1/4" CAP
STANDARD 2 1/4" BRASS HUSK
1/4" NIPPLE TO CONNECT BRASS BREAK AND SOCKET CAP
1/4" HOLE THREADED
BRASS BREAK
WOODEN STEM TO BE DESIGNED BY STUDENT
NO. 18 RUBBER COVERED LAMP CORD
1/4" IRON PIPE TO SCREW INTO WEIGHT, EXTEND THROUGH STEM & SCREW INTO BRASS BREAK
WOODEN BASE TO BE DESIGNED BY STUDENT
MORTISE FOR STEM
1/2" HOLE FOR CORD
ROUTE OUT FOR WEIGHT
LEAD OR CAST IRON WEIGHT
GROOVE FOR CORD
FELT BASE
I.A.V.E.

This project is an especial boon for school shops having limited equipment. It, moreover, gives the student a utilitarian item which will benefit him not only during the remainder of his school life, but long afterwards. Handsome end tables and book ends add to the beauty of a room, but a scientifically designed, good-looking lamp contributes eye comfort, in addition.

Making these lamps, the student learns that a table lamp must be a certain height and the shade a certain diameter, so that a good spread of light will be obtained. The specifications, furthermore, guide the young craftsman to use a white or light-lined shade so that a maximum amount of the light will be reflected on their reading. Beneath the shade, there is an inner translucent bowl designed to distribute the light both upward and downward, to diffuse it softly and eliminate the dangerous glare so often found in the light from a direct-type lamp. A 100- or 150-watt bulb is specified for use in the size of the lamps made in school shops, to give the amount of light found by the engineers to be necessary for comfortable seeing.

Both floor and table models of these lamps have been made, and a variety of bases, including plastic, conglomerate glass and agate, as well as wood and metal, have been designed. White metal bases may also be cast and used.

Shown from left to right are rough blocks of wood with groove into which stem is inserted, polished and completedly assembled. The parts purchased are: the pipe stem and base weight, nipple, bushing, bronze socket holder, socket attached to wiring and plug, approved glass reflector, and plain parchment shade

The girls from the sewing classes may be asked to cooperate in covering the shade wire frames, or the exterior of parchment shades may be painted by the art classes. A co-operative project also may be worked out, requiring each of the girls to cover two shades with silk, while each of the boys make two bases, so that eventually each student will have a real study lamp.

The following pieces are available in the kits for making these lamps:

1. Textolite diffusing bowl, or glass reflector. These conform to I.E.S. specifications.
2. Parchment shade, untrimmed.
3. Wire frame, same size, for making alternate stretched silk shade, if desired.
4. A socket adapter, complete with cord and separate plug and finished in bronze; unit intended for use with 100-watt bulb.
5. Pipe of proper length to run up the inside of the lamp stem. Threaded at both ends and complete with lock nut.
6. Instruction sheet.

INITIAL BOOK ENDS

John L. Leonard, Scottsville, New York

The project, described herewith, possesses a personal touch that will appeal to every student. It is made of plastic material and wood.

Materials for a pair:

4 sheets of plastic, 1/8 by 4 by 5 in.
2 sheets of plastic, 1/8 by 2½ by 6 in.
2 blocks of suitable wood, 1¼ by 4 by 5 in.
4 screws No. 8 by ¾ in.
Casein glue
Powdered pumice stone
Buffing and polishing compounds

NOTE: The cost of plastics may be reduced by using "Lamroc" a laminated plastic material .015 in. thick for the veneering.

Equipment:

Jig saw, coping saw may be used
Jig sander
Belt sander
Clamps or veneer press
Buffing wheel
Assortment of sandpaper

Procedure:

Sand one side of the 4 by 5-in. pieces of plastic with rough sandpaper until all resin and dirt are removed.

Glue the plastic to the sides of the blocks of wood using any good casein glue. Clamp firmly and let stand until the next day.

Draw the initials on a piece of paper and fasten it to the plastic with glue or paste.

Use a jig saw, if it is available, to cut out the initials. A coping may be used, but the job will be rather difficult.

Sand all surfaces. A jig and band sander will come in handy.

Finish sanding with No. 7/0 garnet paper until all scratches and blemishes are removed.

Rub with pumice stone and water. Carefully remove all traces of pumice.

Buff and polish on the buffing wheel.

Fasten the bases to the initials with screws. Have the bases project about an inch on the end the books will be on.

The wood may be finished to suit the taste of the maker. A natural finish is splendid.

TRIPLE CANDLESTICK

Leon H. Baxter, Association for Crippled and Disabled, Cleveland, Ohio

The candlestick described herewith is more difficult to make than any of the previous designs because it is made of thicker metal and because the hammering, to obtain a planished surface and to shape the scroll, requires constant annealing. The colors which follow the flame during the annealing process, indicate that the metal has again become soft enough to work.

The stock for the main part is 3/32 by 1½ by 28 in., and this should first be planished with a fairly heavy ball-peen machinist's hammer on all surfaces and edges. It is a good plan to thin and flare out the two ends to a slightly greater width and less thickness.

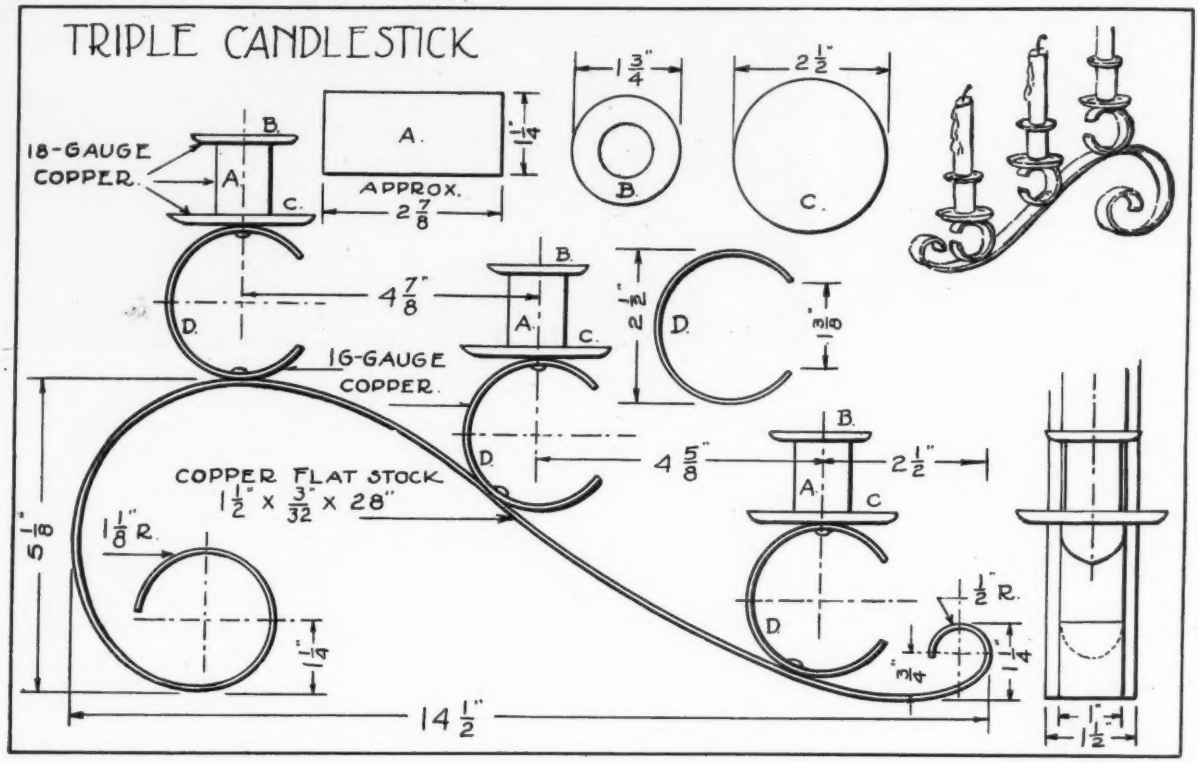


Plate 10

This gives them an interesting finish. Anneal very thoroughly before starting to shape.

It is an excellent plan to draw a full-sized outline, or profile view, to the general dimensions shown on the drawing. Start shaping by pounding the metal over a piece of pipe of good diameter held in a vise, or over the horn of an anvil. Compare constantly with the full-sized detail and endeavor to make the scroll flowing and graceful in outline.

It will be found the metal has to be constantly annealed to insure ease and safety in working, for if hammered when already too hard, there is the possibility of cracking the metal.

The three small supports, indicated at *D* on Plate 10, are made from 16-gauge by 1 by 6-in. pieces of copper. These pieces are curved to a point at each end, as shown in the end view, and planished on surfaces and edges.

Pans *C* are made of 18-gauge copper and are 2½ in. in diameter. These are planished all over and the edges slightly rolled up by hammering either over a rounded stake or on a lead block. Drill a ⅛-in. hole in the center of each for rivets.

Holder *A* is made by either of the methods described in the making of the first candlestick of this series which appeared on page 304 of the September, 1938, issue of this magazine. In either case, the inside diameter must be 13/16 in.

Drip pans *B* are made of 18-gauge copper with a diameter of 1¾ in. These are formed to shape in a similar manner to pans *C*. A 13/16-in. hole must be cut in the center of each with a jeweler's saw.

Lay the base piece flat on its side and arrange the three pieces *D* in their relative positions. At the contact points, mark holes for rivets. Do the same with the upper circumference of *D* and the pans *C*. Center all of these points and drill with a ⅛-in. drill. Rivet all the pieces together.

Place drip pans *B* cupped side down, on a piece of wood and place holders *A* in position.

Place small pieces of solder and flux at the contacting points and apply heat with a blowtorch. Place these two soldered sections at the center of pan *C*, applying flux and solder around the inner edge of *A*. Solder in place.

Clean all parts thoroughly with fine steel wool and finish.

THE STRING NUISANCE TIED UP

J. Orville Wood, South Hills High School, Pittsburgh, Pennsylvania

In every print shop that I have ever visited, worked in, or taught, I have seen the old familiar white cotton twine used for tying up the assembled lines of composed type to keep them from being pied.

In most shops of importance, the pieces of string are scrapped after being taken off the forms. One reason for this is that the time required to save the string is more valuable than the string itself; another reason may be that the length of the piece of string would either be too short or too long for the next job to be tied up, not saying anything about the numerous tangles and snarls into which the string might twist itself. Then, too, no printer wishes to use a string that has one or more knots in it.

All compositors know the care that must be used when tying up a form to avoid pulling the string so tight that it breaks. This, however, may happen even to the best workman.

These nuisances are especially troublesome to the teacher and pupils in a school print shop. Possibly the most annoying is the habit of pupils continually asking for a new piece of string. Carelessness in caring for the piece they had and the use given it soon renders the string worthless. Then when two hundred pupils each day use string, the quantity soon amounts to quite an item.

To overcome this nuisance in the school print shop, the writer has introduced, what he believes, an almost permanent and indestructible string. The first cost is very high, but he has found it the cheapest in the long run. The string he uses is Irish Flax Sinew. This is the cord used for lock-stitch machines in shoe-repair shops for sewing on soles and for other leather sewing jobs. It can be had in white, gray, or black, and in from 5 to 9 cords or strands. One-pound spools cost about $1.75, and contain from 500 to 1,000 yards, depending on the number of strands, and it is almost unbreakable.

Since adopting this string all tying-up trouble has been eliminated.

Our censure of our fellow men, which we are prone to think a proof of our superior wisdom, is too often only the evidence of conceit that would magnify itself, or of the malignity or envy that would detract from others. — *Tyron Edwards.*

MAKING BLOCK CUTS OF YOUR ANCESTORS

May Lillian Lampe,
Weehawken, New Jersey

Daguerre is responsible for the beginning of photography, and this year marks its birth. It is therefore opportune to dig out of the old chest in the attic those irresistible "daguerreotypes" of your ancestors which were put away many years ago, and perhaps have been completely forgotten. The details of the dress, the quaint arrangement of the hair and features are all brought out beautifully on the daguerreotype. The gigantic sleeves, and ornamental hats of the ladies depicted on these old pictures give one a sincere idea of their times.

Born in Cormeilles, France, in 1789, Louis Daguerre was a celebrated scene painter in Paris, and like many artists of his day used a camera obscura for sketching purposes. The idea to capture and fix these camera images photographically rather than to sketch them laboriously by hand no doubt suggested itself to him as it did to others.

As early as 1829 Nicephore Niepce of Paris joined Daguerre in perfecting photography on metal, and they exhibited some examples of their work at the Royal Society in Paris, but Niepce died in July, 1833. Daguerre kept on experimenting, however, and at length produced the method which has been called the "daguerreotype." The process was examined and reported on by the French Government and Daguerre was made officer of the Legion of Honor. With annuities of 6,000 francs settled on Daguerre, and 4,000 francs assigned to the sons of Niepce, the French Government purchased the secret of the daguerreotype in August 19, 1839.

This sensitive surface of Daguerre's photographs was silver, darkened by iodine fumes. Light reflected from objects in front of the camera, entered the shutter, passed through the lens, struck the sensitive plate, and recorded a latent image corresponding to the light and dark areas of the scene in front of the camera. After the plate had been exposed in the camera, it was held over a dish of gently warmed mercury. The mercury vapor clung to the parts of the plate where the light had acted. The silver iodine of the sensitive surface was then dissolved by "Hypo" just as negatives are fixed today and the light areas of the scene in front of the camera appeared mercury white, whereas the dark areas appeared in the black metallic silver of the plate surface.

Block cut of Louis M. Daguerre taken from an old daguerreotype

At this time in London (1835) William Henry Fox Talbot received the same idea of the camera obscura that Daguerre had in Paris. He recorded a latticed window in his ancestral home at Lycock Abbey, Wiltshire, England, with great exactness. Talbot produced the negative-positive concept of photography which is used today. He discovered he could without a camera get good results by placing beautiful laces, flowers, leaves, on a piece of calotype paper. These prints were called "Photograms."

After Daguerre's first success in recording permanent camera pictures, a newly devised portrait lens, and the addition of bromide to the iodine helped to speed up the process of photography even to the point where a Miss Draper, the first American to pose for her picture, had to sit only 10 minutes.

Posing for a daguerreotype was no easy task. In 1839 Miss Dorothy Draper sat with her head in a clamp, her face powdered white, while her brother, Dr. John Wm. Draper, snapped her. This took place on the roof of the New York University building.

It was not long before every shopping district in our big cities in America commercialized the craze for daguerreotypes. Matthew Brady, a New Yorker, photographed every American President this way, from John Quincy Adams to McKinley, excepting William Henry Harrison who died a month after taking office and before the Brady studio in New York started business. Brady also introduced "tinted daguerreotypes on ivory."

In 1855 he induced Alexander Gardner, an expert in wet-plate process, invented by Scott Archer, to come over from England. This process was so superior, that the daguerreotype became a thing of the past. In 1871, Dr. L. Maddox invented the dry plate on glass or celluloid. This was another step in advance and quickly replaced the wet collodion process previously used.

Daguerre, Niepce, and Talbot gave the world a most valuable method of picturing with exactness, personages and scenes with their inventions in photography. The progress made in the work which they started 100 years ago has been truly phenomenal.

Today pictures can be sent across the sea by telegraphy and radio. The improvement made in the radio photo in the period of a year is almost inconceivable. Today the movie industry consumes 200,000 miles of roll film annually. The Eastman Kodak Company in 1888 put the roll film on the market to take the place of the plate and thus the movie developed.

In 1931, the supersensitive panchromatic photographic emulsion was introduced. This is sensitive to all colors of the visible spectrum. Kodak Research Laboratories has speeded up panchromatic film and the results, in the motion-picture industry, in studio photography, in general commercial photography, news photography, astronomical photography, and in "home movie making" are almost beyond human conception.

X-ray photography, another major unit, has been a scientific accomplishment of enormous importance. And now we have the transmission of images over the air, a most phenomenal invention put before the public with the opening of the World's Fair in New York.

Block cut of the author's grandfather taken from a daguerreotype made about 1845

Block cuts of the author's grandmother taken from a daguerreotype made about 1845

President Roosevelt had the honor of being the first chief executive of these United States ever to be recorded by television and April 30, 1939, will go down in history as the day on which a new industry in America made its debut. President Roosevelt was shown with the Presidential party in parade, and later when he was delivering his address at the Federal Government Building, "Court of Peace," which formally opened the World's Fair. Taking in a fifty-mile radius of sight and sound of New York, 200 receivers were busy within the area of Manhattan's spires. Probably 1,000 persons looked in as the curtain rose on this tryout of *television*.

On June 10, 1939, television successfully met the test of threatening weather and unstable light conditions when the electric camera televised the images of King George VI and Queen Elizabeth of Great Britain on their visit to the World's Fair. The electric eye followed the royal pair as they walked down the esplanade of the "Court of Nations." Their images were visible as they passed within 25 ft. of the camera, and they were seen talking with their escorts as the telephoto lens brought them into sharp focus on the viewing screens. The microphone did not pick up what was said, but when the United States Navy Band played "God Save the King" and "The Star Spangled Banner," both strains came through clearly on the video receivers.

Research into the history of television takes one back as far as 1906 when the first early design of cathode-ray tubes was attempted by the Swiss engineers, Max Deickman and Gustav Glage. Recognition is also due to Johann Michael Schmierer, a Russian inventor who carried on the work. The Swiss inventors started but were unable to market their product. In March, 1909, a Swiss magazine called *Prometheus* published an article, "Transmission of Images Over Long Distances." This gives documentary proof that the Swiss engineers were the originators of television. Johann Schmierer has another patent to his credit — a mirrored wheel, popular now in England, operating on the projection principle on television receivers.

In England, television dates back three years — they now have a four-hour-a-day tele-cast, and there are 14,000 television sets in use in the London area and the estimated potential audience is about 30,000.

Dr. Vladimir Zworykin, of Forest Hills, Long Island, invented the iconoscopic eye fifteen years ago. While he designed it, he hardly dreamed that he would live to see television start definitely as an industry.

Recently a new television eye called "Orthocon" has been developed by Harley A. Lams and Albert Rose of Radio Corporation of America Mfg. Co. This device is designed for use at the transmission end of the television system and, therefore, entails no change in existing receivers.

The first step in the making of a block cut from a daguerreotype is the drawing of the sketch. It is advisable to make this about twice the size of the original, using a magnifying glass to pick out the detail. Draft the sketch on paper as near as you can to the original. Now, trace and reverse on the block. It is interesting to study the style of dress, the folds in bodice and sleeves, and the like. Bring out these lines strongly so that the cutting will be easier. This modernization of the antique, that is, to make a linoblock from a daguerreotype is decidedly inspirational. It is worth trying.

OSCILLATING MAGNETIC ENGINE

Byron M. Taylor,
Woodrow Wilson Junior High School,
San Diego, California

The oscillating engine shown in Figure 1, is one in which the radial motion of the armature is converted by a crank into the circular motion of the flywheel. The armature impulse gives a down motion to the connecting rod once in each revolution of the crank. As to energy supply, the engine will run at a sufficiently high speed on six or eight volts, A.C. or D.C.

The parts of the engine are assembled on a base (Fig. 2) consisting of a piece of ¾ by 2 by 3½-in. sugar pine. Chamfer the upper edges and sandpaper the piece all over.

The core of the electromagnet (See Fig. 1) is made of ⅛ by ¾-in. band iron. For sizes and shapes refer to Figure 3. Cut the pieces ⅛ in. longer than the net length, to allow for shaping and bending. Use a vise and a hammer to make the right-angle bends. Drill the holes. File the pole of the left member of Figure 3 to an edge which will act as a pivot for the armature to rock upon. See Figure 1.

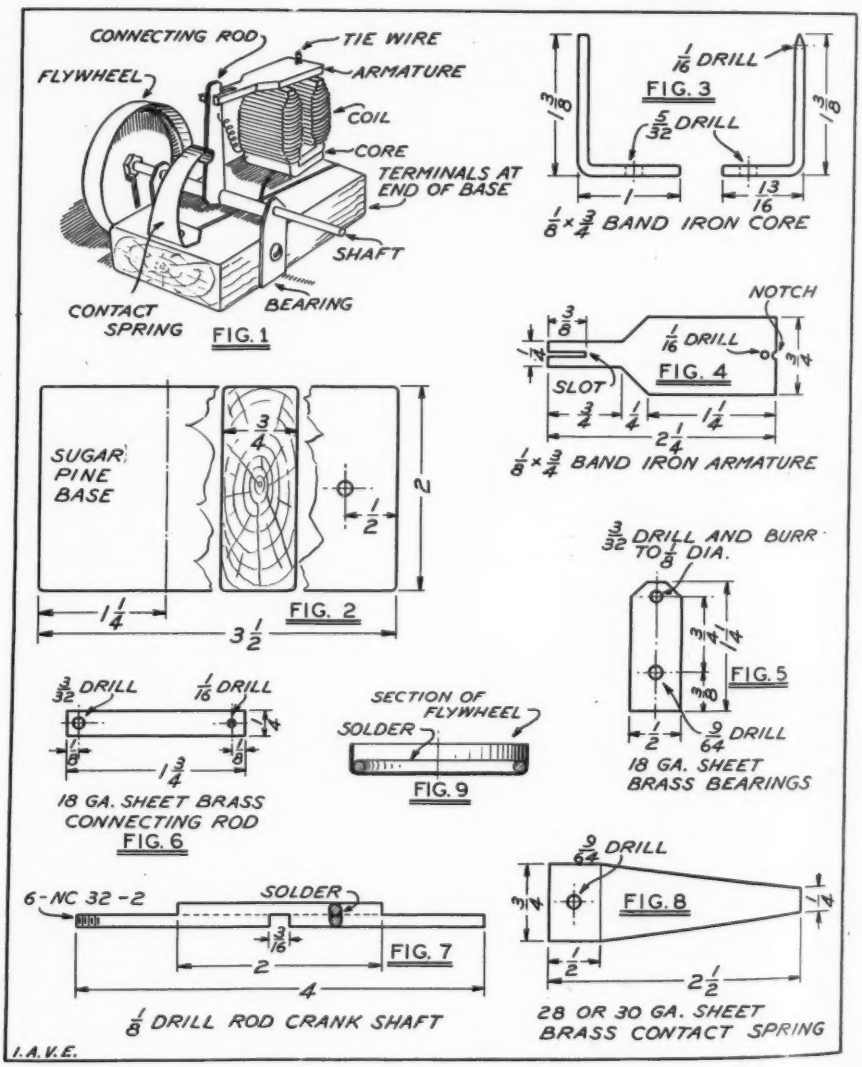
Wind about 15 ft. of No. 20. D.C.C. or S.C.E. magnet wire on each section of the core. First cover the part to be wound with friction tape applied to the iron. Start and finish each winding with a clove hitch leaving the ends about 3 in. long. To prevent the wire slipping off at the ends use bank winding as shown in Figure 1.

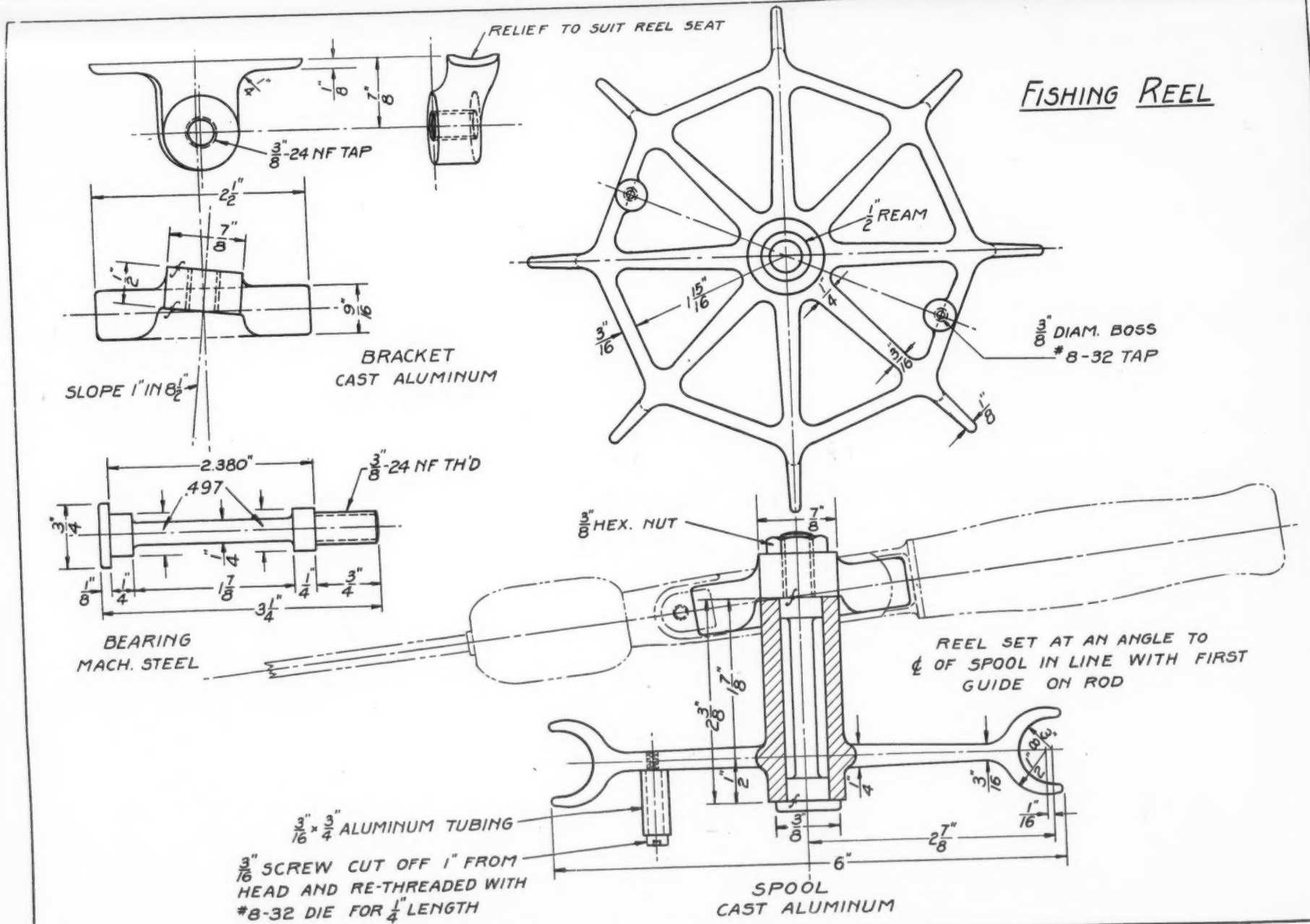
To hold the two sections of the magnet securely to the base, a No. 6, 32 by 1 in., f.h. brass machine screw and nut are used. Pass the screw through the hole shown in Figure 2. Assemble the sections on the projecting screw, put on the nut, and tighten up with a screw driver.

The armature is pictured in Figure 4. Cut a piece of ⅛ by ¾-in. band iron to the length shown and shape it with a hack saw and file. Make the slot for the connecting rod in the following way: Make a hack-saw cut to a specified depth, spread the sides of the slot with a screw driver placed in the slot, correct the V shape thus arrived at by placing a piece of 18-gauge brass in the V and pressing up the iron against the brass. File out a channel across the rear of the armature to take the pivot already formed on the pole piece. Drill the 1/16-in. hole and cut the slot.

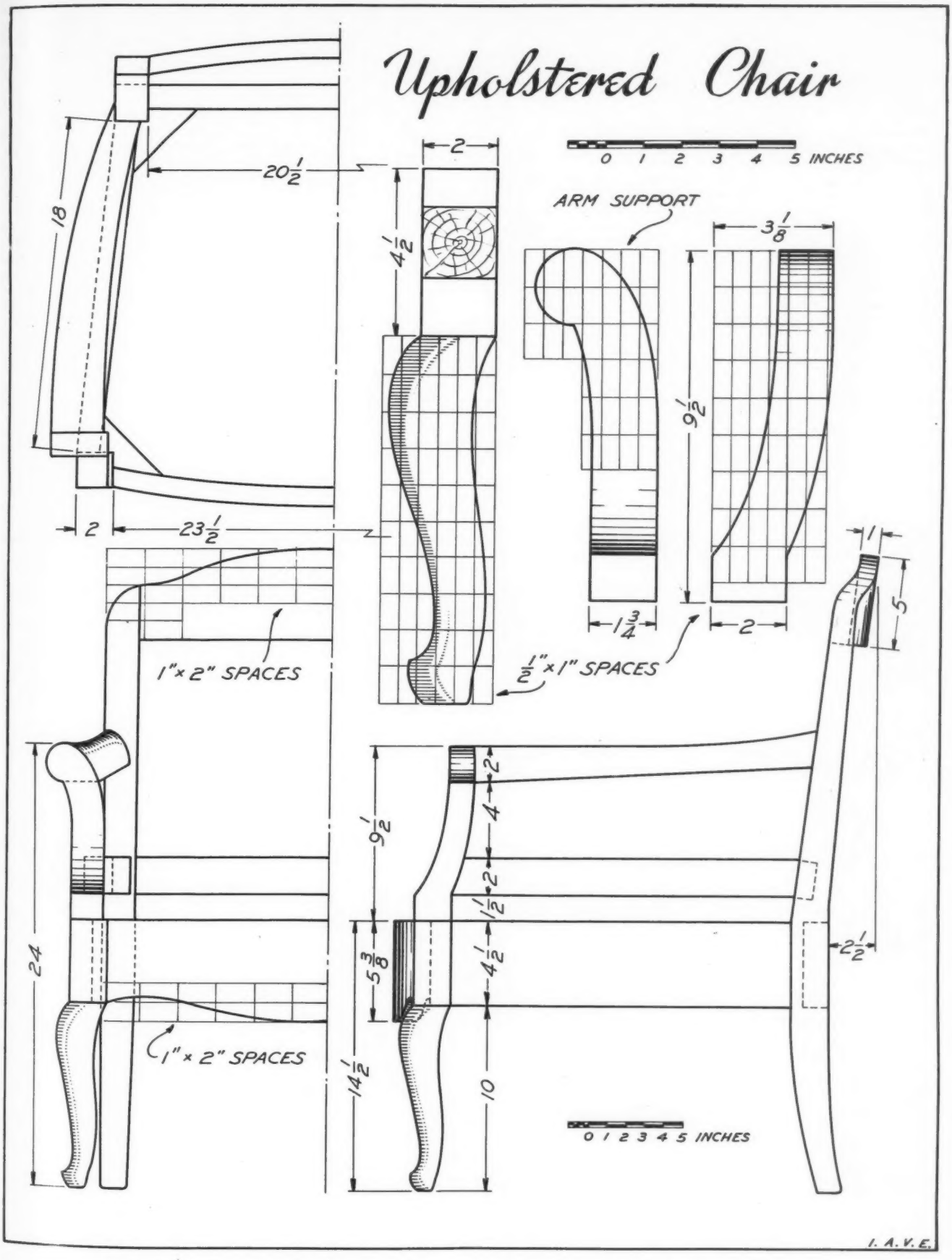
The bearings shown in Figure 5 are of

(Continued on page 293)





Submitted by W. A. DeVette, Technical High School, Erie, Pennsylvania. *(See page 284 for description)*



Submitted by James Chadek, Woodworking Department, Appleton Vocational School, Appleton, Wisconsin

(Continued from page 288)

18-gauge hard-drawn sheet brass. Shape and drill them to the given dimensions. The burring of the 3/32-in. hole (for better wearing efficiency) is done by revolving under pressure a tapered piece of ⅛-in. rod through the 3/32-in. hole.

The connecting rod also is made of a piece of 18-gauge hard-drawn brass. Cut, shape, and drill as shown in Figure 6. Burr out the 3/32-in. hole as just described for the bearings. Make a hack-saw cut into the larger hole to be used as described later.

The crankshaft shown in Figure 7, consists of two pieces of ⅛-in. drill rod. Solder the short piece centrally upon the long piece and with a file remove 3/16 in. of the central portion of the short piece. One end of the crankshaft must be threaded in order that the flywheel may be fastened to it.

Next engage the connecting rod with the crankpin. The slot just made in the rod permits this. With pliers twist the severed ends of the rod in opposite directions sufficiently to allow for the insertion of the crankpin. With the pin in place, close the hole with the pliers until a close fit on the pin is attained.

To pin the connecting rod in the armature slot use a piece of 1/16 by ½-in. Bessemer rod. Put the armature in place on the pivot, and with a piece of iron wire threaded through the 1/16-in. holes, tie them together loosely as shown in Figure 1. The ends of the wire should be twisted together to form a knot.

Several objects could be suggested for use in making a flywheel, but probably the most easily obtainable is the lid of a small can such as a soldering-paste can. It must, however, be under two inches in diameter. Load the rim of the lid with wire solder and tack this to the inside of the lid with a soldering iron as shown in Figure 9. Make the hole for the shaft truly central in the lid. The fitting of the flywheel to the shaft consists of running a nut up on the shaft until it stops, putting on the flywheel as seen in Figure 1, and then securing the flywheel with another nut and a lock washer. Make adjustments until the flywheel will turn very easily.

Next make the contact spring which will energize the coils at the desired position of the crankpin. See Figure 1. The blank for it is shown in Figure 8. Sheet brass of 28 or 30 gauge is suitable for this. After cutting out, bend the brass to shape over the handle of a screw driver, pencil, or other round object. Mount the brush as shown. Before screwing down tight, have the bared end of a 5-in. piece of No. 22 wire between the spring and the base. This wire goes back to one of the terminal binding posts at the rear of the base. For these binding posts, use two No. 6 by ¾-in. r.h. brass wood screws, equipped with brass washers. Under the second post place a lead from one of the coils.

Three magnet leads remain free. Tie two of them together so that the direction of the current flowing in the coils will be in opposite directions as the coils are viewed from above; viz., clockwise and anticlockwise. These leads may be cut very short before joining and the covered splice tucked in between the coils. The remaining lead should then be soldered to a point on the connecting rod about as shown in Figure 1. Leave a loop of wire to afford play for the connecting rod.

Adjust the contact spring to touch the connecting rod when the armature has just passed its highest position as the flywheel is revolved clockwise (i.e., when looking at the end of the shaft which carries the flywheel). This completes the construction. Paint or lacquer all parts except electrical contact surfaces. It is best to do the painting after having first (at least partially) disassembled the parts.

Oil the rocking pivots, the crankpin, the bearings, and the contact point.

AN INTERESTING ART AND CRAFT MEDIUM

Al Belanger, Chicago, Illinois

The modeling sheet made available by a nationally known manufacturer, has a very wide range of application in the classroom and the shop.

This material is a cellulose base sheet which can be modeled or tooled. It is plastic but very tough, and when finished properly will last indefinitely. It may be used by itself as a decorative article, or it may be combined with other materials such as wood or metal. In the classroom it should prove a boon to the teacher as the material is very clean and easy to work with.

This new modeling sheet is one of the finest mediums for the making of relief maps. All the relief needed may be brought out readily on the sheet. It may be colored with water colors or oil colors, or it may be stained or dyed.

For nature study, the child may be taught to model leaves and flowers in relief, and when finished the work may be kept as a permanent exhibit. In the study of insects, it is possible for the students to model the different kinds and color them to make a lifelike exhibit.

In the making of dioramas, many things may be made of the modeling sheet as it will take the finest detail. It may be used to great advantage in the making of models of objects of all kinds. Such items as book covers, book ends, table mats, panels for screens, and many other objects are all suitable modeling-sheet projects. It may be laced together in the same manner as leather, and may be glued to almost any surface.

For the making of puppets the modeling sheet may be used to form faces and bodies which are very light in weight. For this purpose the material is more durable than plaster or clay, as it does not chip or crack.

In the shop it may be used for making patterns for casting purposes. Ordinarily any design in low relief is difficult to make, but with the modeling sheet, a great deal of labor is eliminated, and at the same time, the design may be made more beautiful. In some cases the modeling sheet may be applied to a wood pattern to supply the decorative parts.

In the teaching of art work, this sheet also possesses many advantages. The student, for instance, can make the design the first period, tool or model it the second period, and put on the colors during the third period. The material also may be used to advantage in the teaching of leathercraft, as the same tools may be used and it can be handled much the same as leather.

In art work the modeling sheet has many applications. The making of dies for

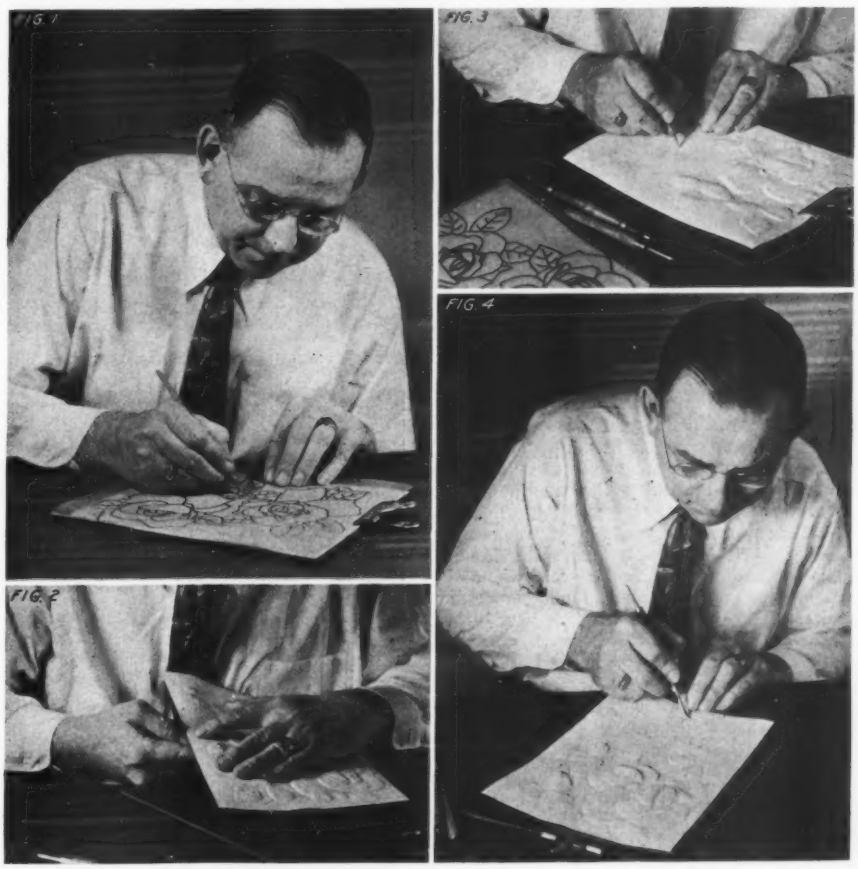
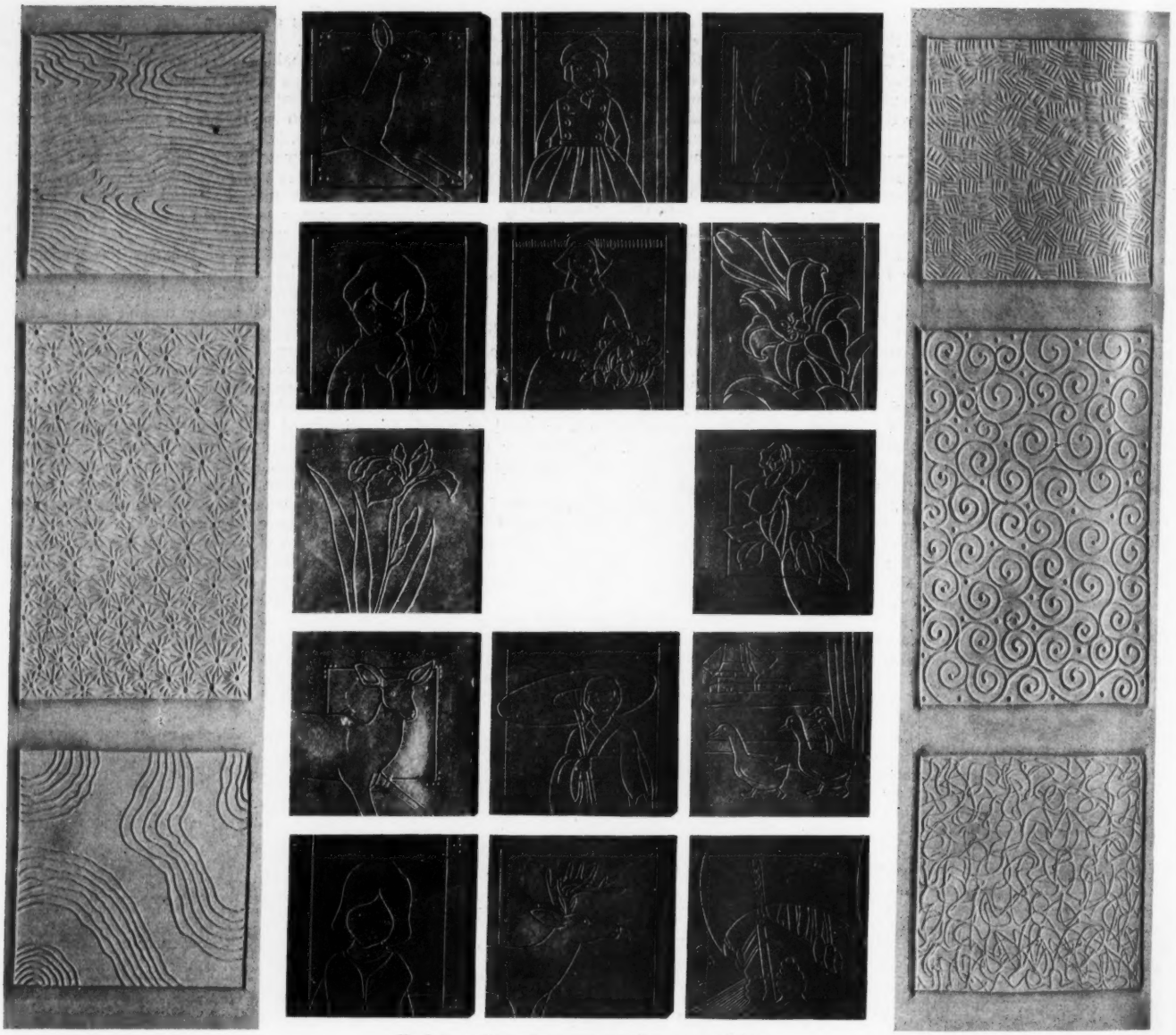


Fig. 1. Transferring the design. Fig. 2, Modeling from the rear. Fig. 3, Tooling the front surface. Fig. 4, Modeling from the front



Various types of ornamentation on modeling

embossing is an example. Previously, this work involved four distinct steps to make the pattern. First a sketch had to be made, and from it a wash drawing. Then a wax master pattern was modeled, and finally the plaster mold was cast from this, after which pattern was cast into the plaster mold. By using the modeling sheet, one simply traces the design on the sheet, tools in the relief, colors it, and the final pattern is complete. Furthermore, if the desired effect is not attained, at very little expense the work can be done over. By teaching this method in the schools, the student would be preparing for the modern way of doing this type of work, as a nationally known diemaker with thirty years' experience has adopted it.

In the designing of tiles, the modeling sheet is ideal. All that is required is to model the relieved parts, the background being left smooth, and it is ready for the casting of plaster molds. It is possible to cast directly on the sheet if the sheet is first coated with lacquer and then waxed with a solution of wax thinned with benzine. The plaster will

Fig. 6. Book ends

release very easily if the sheet is properly treated.

The making of plaques also furnishes many suitable projects. The design may be tooled on the modeling sheet, and a rubber mold may be made directly from it. If desired, the plaque can be used alone, mounted, or colored, in the same manner as an ordinary plaque. To prepare this plastic material for painting, it is merely necessary to coat it with lacquer. Many attractive inexpensive articles may be made by covering cigar boxes, tin cans, bottles, jars, and book covers. In some cases all that is needed is a small panel or strip to decorate an object. After it has been properly mounted it can be finished as a part of the original by staining to match the wood, painting, dyeing, and the like.

When combined with wood, many useful and attractive items such as book ends, broom holders, tie racks, and other projects of this type may be made. Practical things such as hatbands and belts also make interesting and useful projects. Door panels, fire screens, and over mantel panels are fine projects for the advanced students.

In making items of this type, they may be glued, nailed, or laced, as the occasion may require. In some cases all of these features can be combined.

In preparing a project, the first step is to draw the design on a piece of tracing paper. When the design has been completed, it is placed over the modeling sheet and held with a paper clip as shown in Figure 1. The design is then traced with a 3H lead pencil. A lead pencil is the best medium for tracing the design, as the lead slides more easily than does a liner or stylus. When the design has been traced the pattern is removed and any lines which are not distinct enough may be gone over. When this is finished, the sheet is ready for moistening. Do not soak the sheet, but merely moisten it until it begins to curl. If too wet, it cannot be worked successfully. The moistened sheet should then be allowed

Fig. 7. Book ends

Some fine examples of modeling

to stand for about five minutes so that the texture of the sheet becomes uniform. This will add greatly to the workability of the sheet. The outlines are then gone over with a ball point or lining tool. After the outline has been completed, the modeling or raising is done from the back with a ball-pointed modeler. The sheet is held in the hand with the fingers spread as shown in Figure 2. The ball tool is then worked back and forth with a gentle pressure. Do not attempt to raise high relief in one stroke, but rather go over it again and again, raising the part a little each time. This method will eliminate any wrinkles or uneven sections.

The next step is to finish the tooling on the front surface. In many cases the outline may be deepened, depending on the type of design being executed. See Figure 3. Another method is to use the diamond-pointed modeling tool, bringing the tool up to the line and working away from the line, leaving a clear raised design. See Figure 4. Some types of design may be worked with the diamond point alone. In this case the outline is made the same as in the other method, but no raising is done from the back. In tooling, the tool should always be drawn toward the operator. If necessary, the modeling sheet should be turned around as the work progresses. It is not advisable to tool away from the operator especially with a pointed tool such as the diamond point. In making long, straight lines, the side of the diamond point should be used as shown in Figure 5. This method helps to

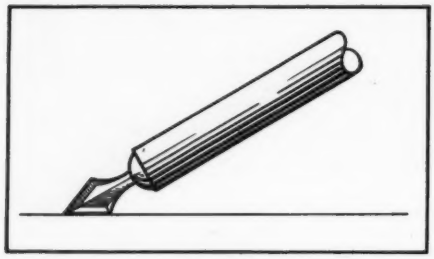


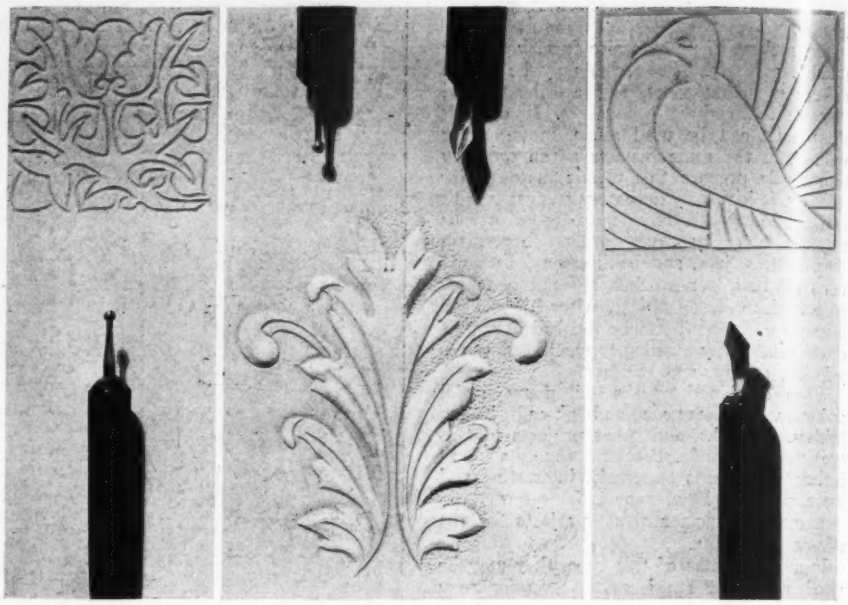
Fig. 5

guide the tool. When making large curves or circular lines, the tool should be held firmly and the paper moved around to assist the following of the design. This renders the making of curves easier, since one can, in that way, trace the curves more readily than by trying to make them in a number of strokes. Furthermore, the curves are more perfect. If, after all the tooling has been done, the relief is not high enough, it may be heightened without losing any of the finished details.

In a case where a piece is to be laced, it is best to color it first and then punch the holes while it is still damp. When dry, the modeling sheet is rather difficult to punch. See Figures 6 and 7.

Where a piece is to be mounted, it may be shaped to conform to the shape of the object to which it is to be applied, and left to dry. Work should not be mounted by means of glue unless it has been dried thoroughly before the glue is applied.

Before mounting pieces with rather high relief, it is well to lacquer the raised parts on the back. The parts to which the glue is to be applied should not be lacquered. Lacquering helps to harden the modeling and it also acts as a waterproofing agent. Glued pieces may be stained or colored before or after they are mounted, depending on the type of finish to be used. Where the finish is



The tools, and what can be done with them

to be water stained or water colored, the piece may be finished either before or after it is mounted. Where oil stains or colors are used, it is best to color after all the mounting is completed. To make permanent water colors or water dyes, the piece should be given a final coat of transparent lacquer. Oil finishes may be varnished. Metal leaf also may be applied with complete success. The types of finishes which may be used are practically unlimited.

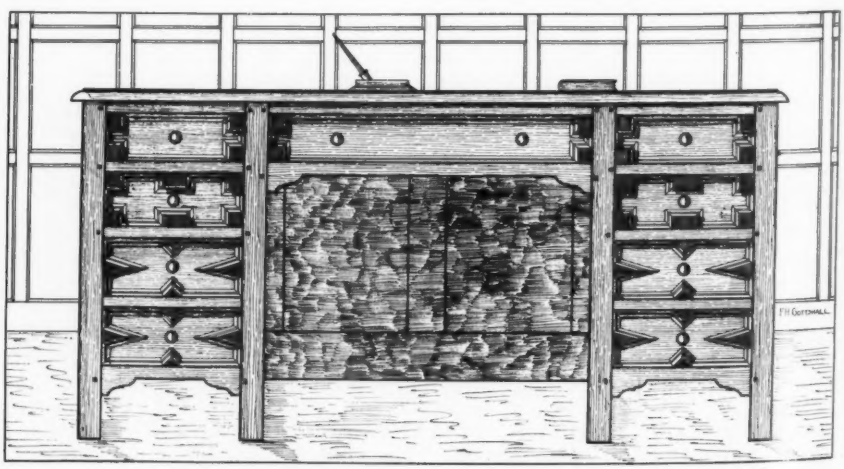
FLAT-TOP DESK

Franklin H. Gottshall, Scotch Plains, New Jersey

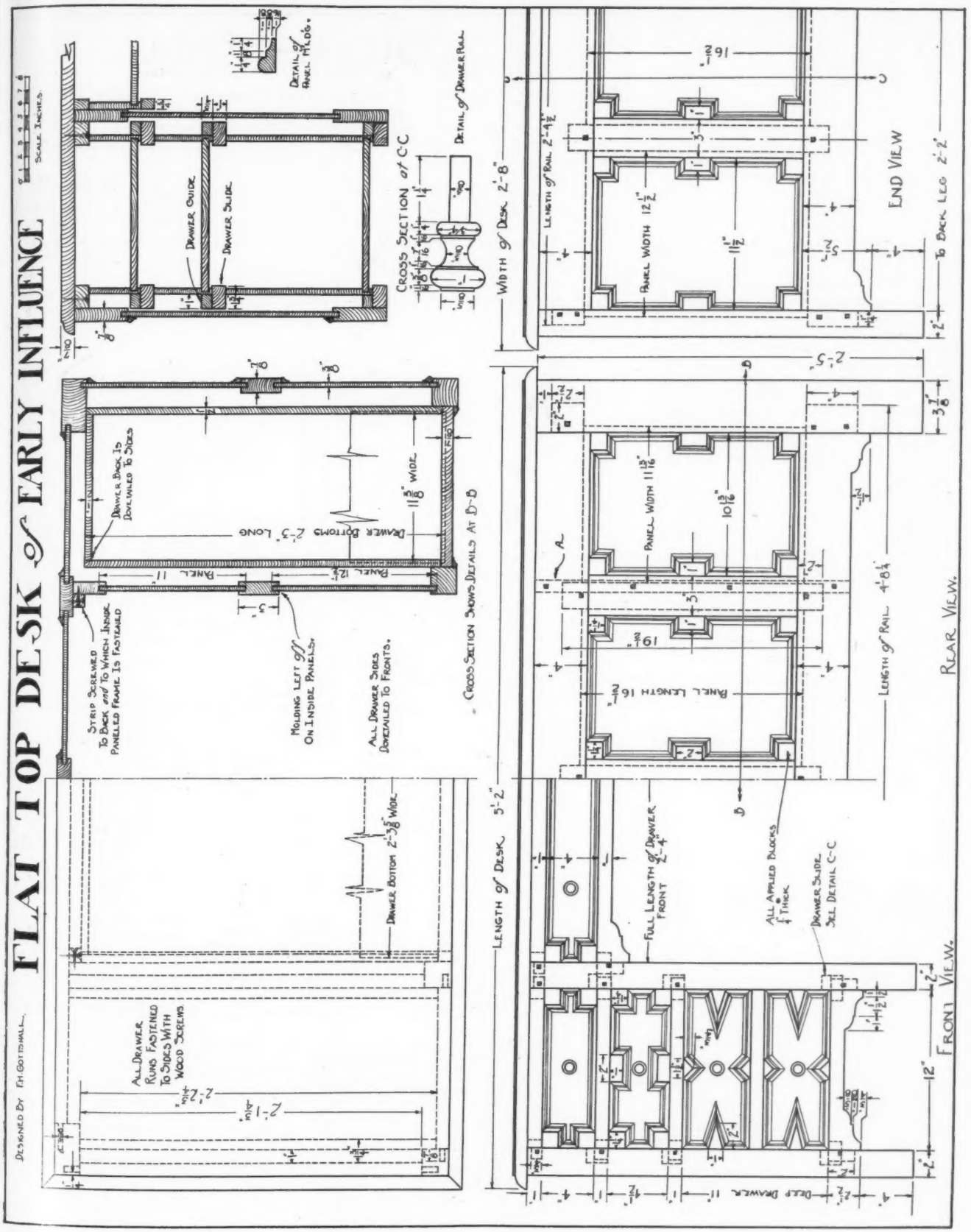
People are likely to think of flat-top desks as objects of utility and forget that they may be be made beautiful as well. No piece of furniture, no matter how common its use, should lack those properties which give satisfaction to the aesthetic sense. It is up to those who teach industrial-arts subjects to foster in their students an appreciation for fine proportion, beauty of line and form. It is as important as a knowledge of sound construction.

The fact is that good construction is one of the elements that gives beauty to a piece of furniture. But it is only one of the essential elements. Note some of the structural features of the desk shown in the illustration. The rails are mortised into the legs in such a way that their outside surfaces are flush with the outside surfaces of the legs. Besides being glued they are pinned. The wooden pegs are not hidden. They are very perceptible and add to the character of the desk. Dowel joints are not used in the desk. They always are an indication of inferior construction. Mortise-and-tenon joints denote the highest type of construction. The drawers are dovetailed together, another mark of quality.

Only by cultivating an aesthetic sense himself can the instructor impart it to a student. More attention must be paid to beauty of design if the industrial arts are to be lifted to a higher level. The writer has always held that more could be done in this direction if an honest effort were made. He has designed his elementary course of instruction with this fact ever before him. His conviction is that the simplest object the boy is asked to make need not lack beauty.



Flat-top desk designed by Franklin H. Gottshall


FLAT TOP DESK of EARLY INFLUENCE
DESIGNED BY F.H. GOTTSHALL
SCALE INCHES
DETAIL OF PANEL MLDG.
DRAWER GUIDE
DRAWER SLIDE
CROSS SECTION of C-C
DETAIL of DRAWER RAIL
DRAWER BACK IS DOVETAILED TO SIDES
DRAWER BOTTOMS 2'-3" LONG
11 3/8" WIDE
PANEL 12 1/2"
PANEL 11"
STRIP SCREWED TO BACK and TO WHICH INSIDE PANELLED FRAME IS FASTENED
MOLDING LEFT off ON INSIDE PANELS.
ALL DRAWER SIDES DOVETAILED TO FRONTS.
CROSS SECTION SHOWS DETAILS AT D-D
ALL DRAWER RUNS FASTENED TO SIDES WITH WOOD SCREWS
2'-1 1/16"
2'-2 1/16"
DRAWER BOTTOM 2'-3 3/8" WIDE
LENGTH of DESK 5'-2"
WIDTH of DESK 2'-8"
LENGTH of RAIL 2'-4 1/2"
PANEL WIDTH 12 1/2"
END VIEW
TO BACK LEG 2'-2"
2'-5"
PANEL WIDTH 11 1/16"
10 1/8"
PANEL LENGTH 16 1/2"
LENGTH of RAIL 4'-8 1/4"
REAR VIEW.
FULL LENGTH of DRAWER FRONT
ALL APPLIED BLOCKS 1" THICK
DRAWER SLIDE SEE DETAIL C-C
FRONT VIEW.
DEEP DRAWER 11"

The flat-top desk is rather plain as to line. Simplicity was aimed at in its design. The applied blocks and moldings, together with a little color, are its only decorations. When we introduce color into our scheme, we again make a new departure from the accepted rule of the average classroom. Why not more color? The master cabinetmakers used it a few centuries ago when its use engendered far greater difficulties than today. Because of a lack of knowledge of how to combine colors, or because of custom, or both, it is not made use of as much as it deserves to be. The applied blocks fastened to the panels and drawer fronts are painted black. Lamp black ground in oil and mixed with a little varnish should be used to paint these. The molding is painted with Tuscan red color mixed with varnish. The desk itself should be stained with burnt umber mixed with turpentine to thin it, or a brown mahogany stain. If a darker stain is desired, Van Dyke brown could be used instead of burnt umber. After the stains and filler have been applied, they should be followed with the usual protecting coats of shellac or varnish. It will be found best to stain the desk before the moldings and blocks are applied. These may be painted before they are fastened. They may be tacked on with No. 18 wire brads. The holes should be filled with putty that has been colored beforehand.

The desk is a suitable piece of furniture to put into a simple or a pretentious setting. Oak or maple should be used to make it. It is patterned after early American chests but the moldings applied in geometrical patterns denote Jacobean influence. The illustration shows how well it would look in a den or an office.

Several peculiar features should be noted about the desk. It has only two back legs and four front legs. The rear of the desk looks very much like a chest and is very beautiful. The back legs are also wider than the front legs. Since the inside paneled frames are fastened to the back frame, the stiles on the latter are spaced so that the inside frames can be fastened to them. Another peculiar feature is the method of decorating the lower drawer, which makes it appear as two shallow drawers instead of one deep drawer. It should furthermore be noted that the posts are rabbeted to receive the panels. No molding or blocks are applied to the inside paneling, that is, the paneling under the desk unless so desired, since this lack is not noticeable there.

Bill of Material

Oak or Maple:

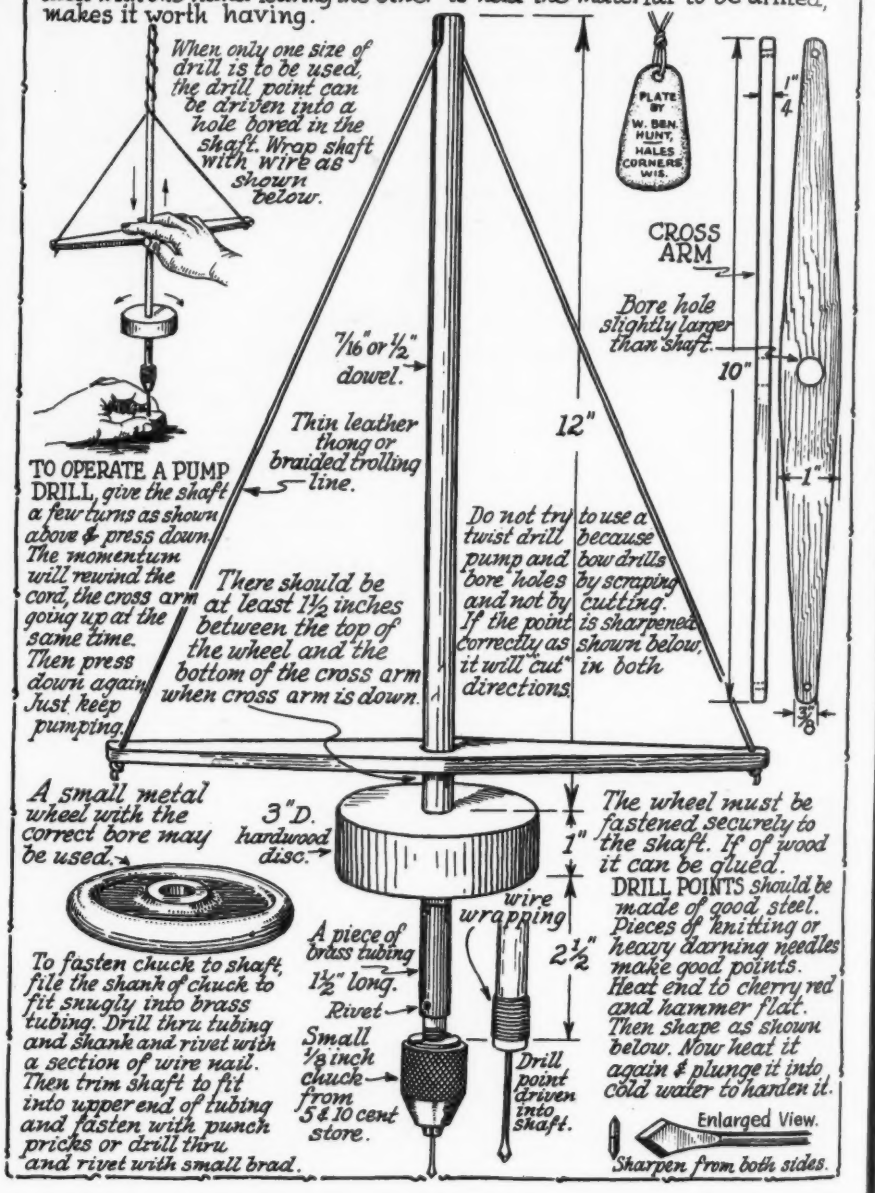
1 pc.	⅞ x 32" x 5' 2"	Top
4 pc.	2 x 2 x 29"	Front legs
1 pc.	⅞ x 4 x 28"	Long drawer
2 pc.	⅞ x 4 x 12"	Upper drawer fronts
2 pc.	⅞ x 4½ x 12"	Middle drawer fronts
2 pc.	⅞ x 11 x 12"	Lower drawer fronts
8 pc.	⅞ x 1 x 13¾"	Rails between drawer fronts
1 pc.	⅞ x 1 x 29¾"	Rail above long drawer
1 pc.	⅞ x 2½ x 29¾"	Rail under long drawer
2 pc.	⅞ x 2½ x 13¾"	Rails under lower drawers
4 pc.	⅞ x 4 x 28½"	Top rails on end frames and inside frames
4 pc.	⅞ x 5½ x 28½"	Bottom rails on end and inside frames
1 pc.	⅞ x 4 x 56¼"	Top rail on rear frame
1 pc.	⅞ x 5½ x 56¼"	Lower rail on rear frame
10 pc.	⅞ x 3 x 19½"	Stiles on all frames
4 pc.	⅜ x 12½ x 16½"	Panels on end frames
4 pc.	⅜ x 11 13/16 x 16½"	Panels on rear frame
4 pc.	⅜ x 12½ x 16½"	Front panels on inside frames
2 pc.	⅜ x 11 x 16½"	Rear panels on inside frames

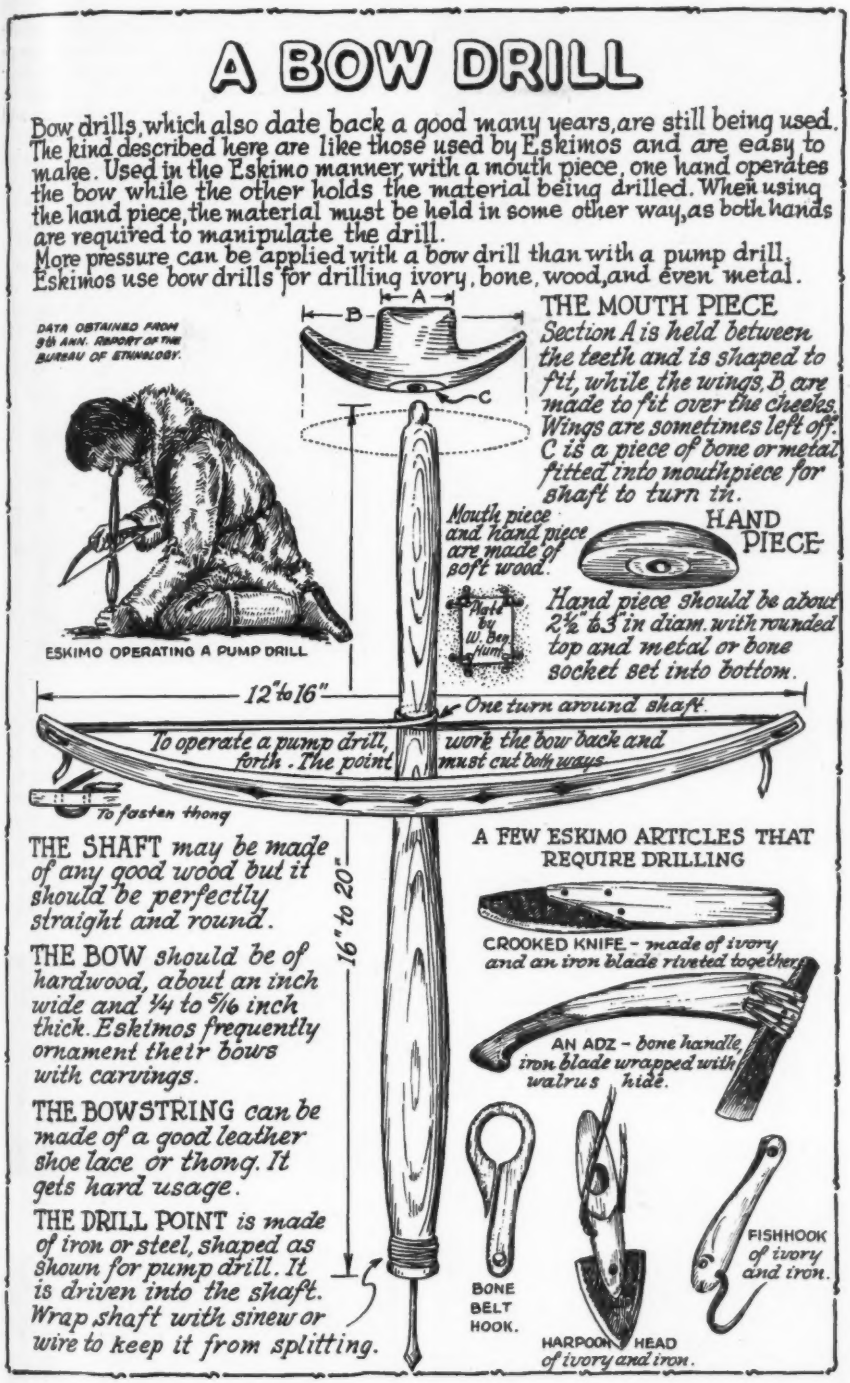
Pine or Poplar:

8 pc.	1 x 1¾ x 26¾"	Drawer runs fastened to outside frames
8 pc.	1 x 1¾ x 27¾"	Drawer runs fastened to inside frames
4 pc.	¾ x 1 x 26¾"	Drawer runs for long drawer (upper and lower)
12 pc.	¾ x 1 x 25¾"	Drawer guides for all small drawers
6 pc.	½ x 4 x 27¾"	Sides for all upper drawers
4 pc.	½ x 4½ x 27¾"	Sides for middle drawers
4 pc.	½ x 11 x 27¾"	Sides for lower drawers
1 pc.	½ x 27⅝ x 27"	Bottom for long drawer
6 pc.	½ x 11⅜ x 27"	Bottoms for small drawers
1 pc.	½ x 3¼ x 28"	Back for long drawer
2 pc.	½ x 3¼ x 12"	Backs for upper drawers
2 pc.	½ x 3¾ x 12"	Backs for middle drawers
2 pc.	½ x 10¼ x 12"	Backs for lower drawers

A PUMP DRILL

The pump drill is at one and the same time, an ancient, a modern and a handy tool. It was and is still used by Indians and other craftsmen for shell, coral, turquois and other material. The fact that it can be operated with one hand leaving the other to hold the material to be drilled, makes it worth having.


When only one size of drill is to be used, the drill point can be driven into a hole bored in the shaft. Wrap shaft with wire as shown below.
PLATE BY W. BEN HUNT, HALES CORNERS, WIS.
CROSS ARM
Bore hole slightly larger than shaft.
7/16" or ½" dowel.
10"
12"
1"
Thin leather thong or braided trolling line.
TO OPERATE A PUMP DRILL, give the shaft a few turns as shown above & press down. The momentum will rewind the cord, the cross arm going up at the same time. Then press down again. Just keep pumping.
There should be at least 1½ inches between the top of the wheel and the bottom of the cross arm when cross arm is down.
Do not try to use a twist drill because pump and bow drills bore holes by scraping and not by cutting. If the point is sharpened correctly as shown below, it will cut in both directions.
A small metal wheel with the correct bore may be used.
3" D. hardwood disc.
The wheel must be fastened securely to the shaft. If of wood it can be glued.
1"
2½"
wire wrapping
A piece of brass tubing 1½" long.
Rivet
Small ⅛ inch chuck from 5 & 10 cent store.
Drill point driven into shaft.
DRILL POINTS should be made of good steel. Pieces of knitting or heavy darning needles make good points. Heat end to cherry red and hammer flat. Then shape as shown below. Now heat it again & plunge it into cold water to harden it.
Enlarged View.
Sharpen from both sides.
To fasten chuck to shaft, file the shank of chuck to fit snugly into brass tubing. Drill thru tubing and shank and rivet with a section of wire nail. Then trim shaft to fit into upper end of tubing and fasten with punch pricks or drill thru and rivet with small brad.


A BOW DRILL
Bow drills, which also date back a good many years, are still being used. The kind described here are like those used by Eskimos and are easy to make. Used in the Eskimo manner with a mouth piece, one hand operates the bow while the other holds the material being drilled. When using the hand piece, the material must be held in some other way, as both hands are required to manipulate the drill.
More pressure can be applied with a bow drill than with a pump drill. Eskimos use bow drills for drilling ivory, bone, wood, and even metal.
DATA OBTAINED FROM 9th ANN. REPORT OF THE BUREAU OF ETHNOLOGY.
ESKIMO OPERATING A PUMP DRILL
A
B
C
THE MOUTH PIECE
Section A is held between the teeth and is shaped to fit, while the wings, B are made to fit over the cheeks. Wings are sometimes left off. C is a piece of bone or metal fitted into mouthpiece for shaft to turn in.
Mouth piece and hand piece are made of soft wood.
HAND PIECE
Hand piece should be about 2½" to 3" in diam. with rounded top and metal or bone socket set into bottom.
Photo by W. Bay Hunt
12" to 16"
One turn around shaft.
To operate a pump drill, work the bow back and forth. The point must cut both ways.
To fasten thong
THE SHAFT may be made of any good wood but it should be perfectly straight and round.
THE BOW should be of hardwood, about an inch wide and ¼ to 5/16 inch thick. Eskimos frequently ornament their bows with carvings.
THE BOWSTRING can be made of a good leather shoe lace or thong. It gets hard usage.
THE DRILL POINT is made of iron or steel, shaped as shown for pump drill. It is driven into the shaft. Wrap shaft with sinew or wire to keep it from splitting.
16" to 20"
A FEW ESKIMO ARTICLES THAT REQUIRE DRILLING
CROOKED KNIFE - made of ivory and an iron blade rivited together
AN ADZ - bone handle, iron blade wrapped with walrus hide.
BONE BELT HOOK.
HARPOON HEAD of ivory and iron.
FISHHOOK of ivory and iron.

KINKS FOR THE HOME CRAFTSMAN

William L. Hunter

The home craftsman today must be versatile and resourceful. Gadgets of all kinds are finding their way into every room of the house. Repair and upkeep jobs, new constructions, and hobby activities all tax the intelligence of the homeworker who must get things done with the least possible expense and with a minimum of equipment.

The kinks presented herewith are all attempts to set forth an easy way of doing common tasks which must be performed by the handy man about the home. Many of the kinks are also useful to the industrial-arts teacher in his shop and laboratory.

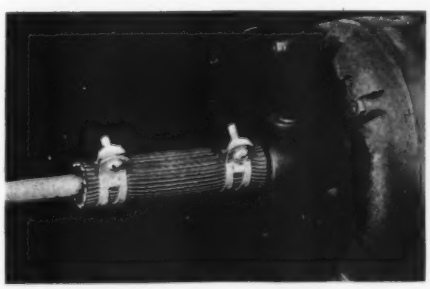


Fig. 1. Flexible coupling

One is often faced with the necessity of attaching a shaft to a motor. Of course, a universal joint of some kind is needed. A piece of good hose and a couple of hose clamps, put on as shown in Figure I, serve the purpose very nicely.

Occasionally one wants to make some small holes in a concrete wall or floor. Special drills, of course, are obtainable but the job can be done just as well with an old saw file. Grind the cutting point on an emery wheel as shown in Figure 2. Because of its

Cutting holes into concrete

hardness this tool will cut into concrete quite rapidly. See Figure 3. Fiber or hardwood plugs driven into the holes, will hold very securely.

Quite often one's oilstone becomes hollow and needs to be trued down. The common recommendation is to rub the stone on a concrete floor or on a surface sprinkled with fine sand. This process is quite slow. A much faster way to true down a stone is to use aluminum oxide or carborundum grit on a metal surface as shown in Figure 4. The grits mentioned are standard and relatively in-

Fig. 4. Truing an oilstone
Fig. 5. Brush container
Fig. 6. Wrapping a used brush in tin foil

expensive. In from 10 to 15 minutes an ordinary stone can be restored to a plane surface. The grit size should be from 60 to 100. The coarser the grit the faster the cutting action but also the rougher the resulting surface on the oilstone. No other cutting agent is needed.

Every home needs a paint brush usable at all times. If the top is cut out of an old fruit-jar cap and a tomato can of appropriate size soldered on so as to provide an extension for the cover, room is provided for a paint brush as shown in Figure 5. A hole in the brush handle and a nail soldered on the inside of the can so as to engage the hole and keep the bristles off the bottom of the jar complete the device. Turpentine or any other soluble or even kerosene, may be used and the brush will be kept soft and pliable for months at a time.

Another way to keep paint brushes for shorter periods of time is to wrap them up in lead or tin foil or other impervious wrapping material so that the air cannot get at the paint or other material to harden it. See Figure 6.

One often needs to splice ropes or keep the ends from raveling. Rope splicing is a very fine art, but like striking a fire with steel and flint, it is seldom done by anyone but a Boy Scout in order to pass some test. A

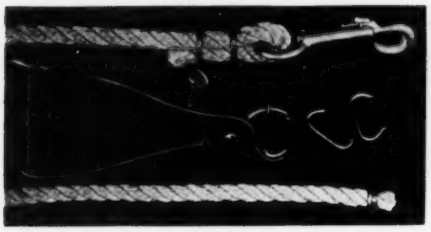


Fig. 7. Rope fastener

far simpler and much quicker way is to use hog rings. These and the ringer shown in Figure 7, are available at hardware stores at a minimum cost and can be used by anyone.

Zippers on overshoes, galoshes, and other items of apparel are fine, but they sometimes tax the patience of a Job unless a drop or two of oil are used occasionally. See Figure 8.

Fig. 8. Oiling zippers

A single electric motor can be made to serve several jobs if a type of mounting is employed so that the motor can be quickly shifted from one place to another. As shown in Figure 9, butt hinges with removable pins can be made to serve very nicely for this purpose. One portion of the hinge is fastened to the block of wood which in turn is secured to the motor. The parts of the other hinges which match the half of the hinge on the motor base are then screwed down to the several places where power is desired. By merely pulling the hinge pin the motor can be quickly moved from place to place.

Every kitchen needs some place where bills

Fig. 9. Motor mounting

can be kept. An ordinary spring paper clip, such as is shown in Figure 10, can be made to serve nicely. Simply put a flathead screw

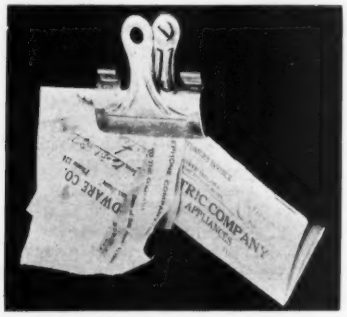


Fig. 10. Clip for bills

through one of the handles and secure it to a wall or other convenient place and it is ready to go to work.

Fig. 11. Fence-post driver

When driving steel fence posts one can do the job quickly and easily by using a piece of iron pipe large enough to slip easily over the post. As shown in Figure 11, a cap is put on the pipe and the pipe is raised up and down to act as a maul to drive the post.

Fig. 12. Jar for odds and ends

Shelf space is often at a premium in the home workshop. Figure 12 shows how a jar lid may be fastened to the underside of the shelf with screws. The jar holding small screws or other articles, may then be turned to remove it from the cap.

In making outdoor electric lanterns one sometimes needs to cut off a section of a bottle. See Figure 13. This can be done quite evenly and with considerable certainty by

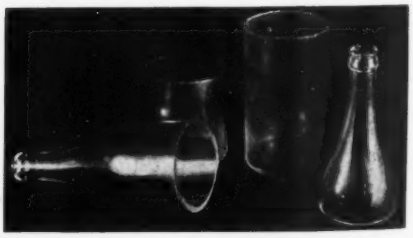


Fig. 13. Cutting bottles

Fig. 14. Adjustable lamp

using a piece of nichrome resistance wire and heating it red hot with an appropriate supply of electrical energy. A single turn of the wire is wrapped around the bottle at the desired place of break. Of course, the wires must not touch each other. The wire is heated for about 40 seconds and then the bottle is plunged neck first and straight down into a bucket of cold water.

Figure 14 shows an adjustable lamp for the home workshop bench which may be made of some scrap ½-in. pipe and some fittings. If the two pieces of pipe are each 18 in. long, one has a lamp that reaches anywhere within a 3-ft. radius.

DRAWING BOARD AND T SQUARE FOR LAYING OUT SLIDES

Curtis Tracy,
Derry Township Public School,
Hershey, Pennsylvania

The drawing board and T square described herein are the outgrowth of a real need which arose in carrying on a visual-education program.

The board has been found most useful in the production of slides to be used in drafting, mathematics, and science. As is evident from the illustration, the board holds four of the slides, while the graduations on the board make it possible to accurately locate each progressive step on the successive slides in the same place.

The four slides shown in the illustration demonstrate the four steps in laying out a hexagon. To draw circles with a compass on the frosted glass, paste a piece of Scotch tape over the intersection of the center lines. This will serve well to hold the pin of the compass, and may be readily removed after the circle is drawn.

The rectangle (shown in the illustration with a light broken line) and the dot on each of the slides show the usable slide area, and also the place to grasp the slide area, and placing it in the projector.

A SIMPLE CIGARETTE BASKET

E. LeRoy Longley, Baltimore, Maryland

The cigarette basket described herein, is a miniature replica of the log basket standing near the fireplace with its fresh supply of logs for the fire.

The cigarette basket is very simple to make. Just two pieces of material, both small and different for the sake of contrast and beauty. These materials may be copper and brass, tin plate and copper or brass, black iron with copper or brass, or any other combination that may be chosen.

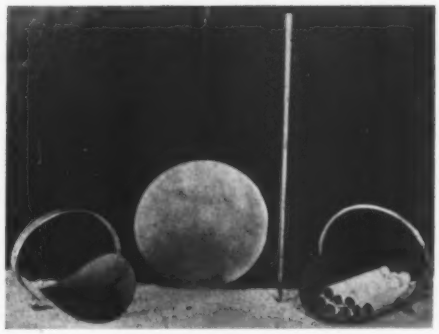
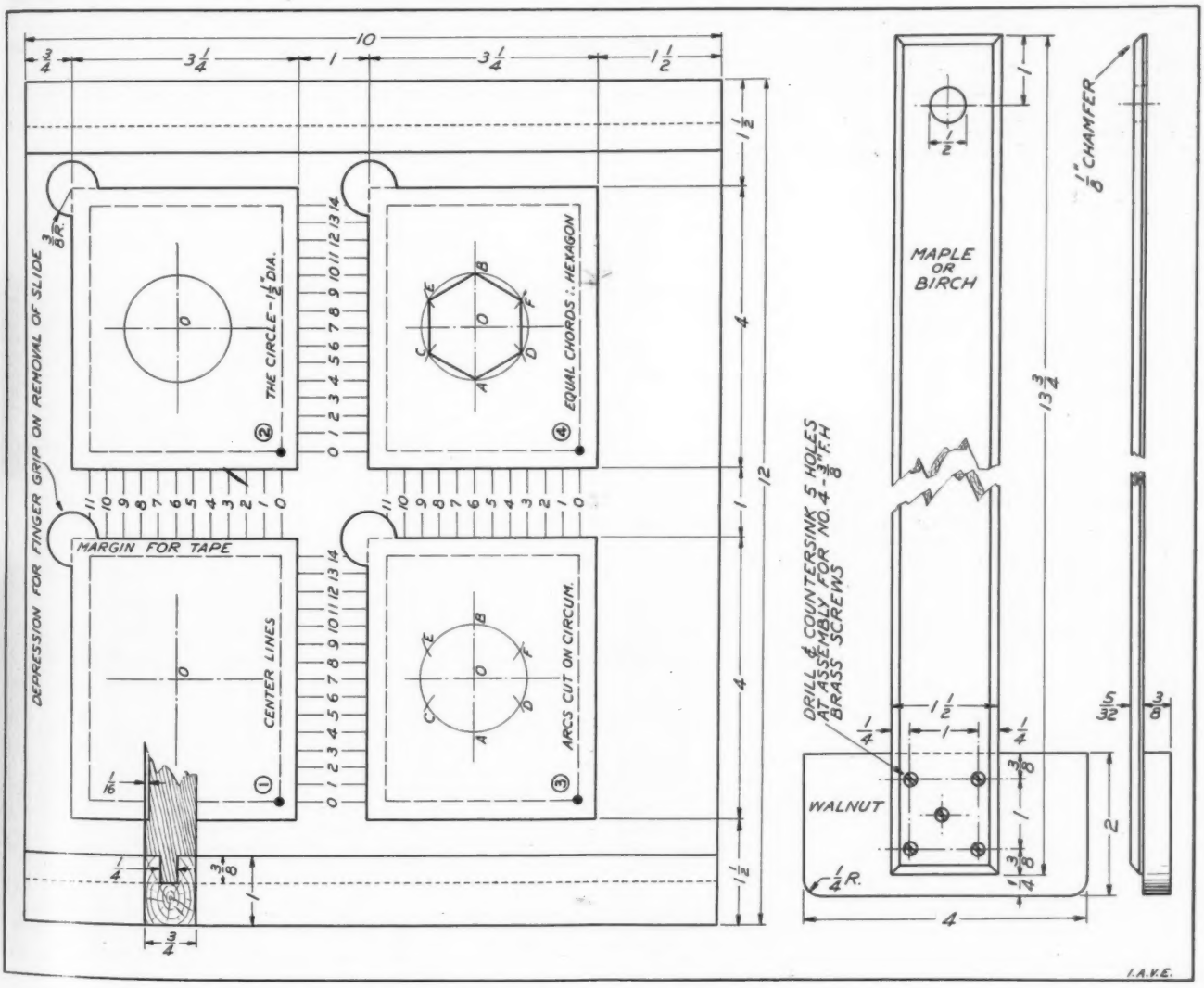


Fig. 1. Cigarette basket

The handle may be made of a ⅛-in. round rod or from 18-gauge sheet metal. When the latter is used, it may be shaped as shown in Figure 2. It will look best if the sheet metal is hand hammered and the basket itself left smooth. In the case of the rod, the ends are forged wide and flat and are shaped into simple feet. The handles must be made to fit the basket.


THE CIRCLE - 1½" DIA.
EQUAL CHORDS :. HEXAGON
MARGIN FOR TAPE
CENTER LINES
ARCS CUT ON CIRCUM.
DEPRESSION FOR FINGER GRIP ON REMOVAL OF SLIDE
MAPLE OR BIRCH
WALNUT
DRILL & COUNTERSINK 5 HOLES AT ASSEMBLY FOR NO. 4 - ⅜" F.H. BRASS SCREWS
⅛" CHAMFER
I.A.V.E.

Drawing board and T square for laying out slides

After completing basket and handle, they may be either sweat-soldered or riveted together.

JIG FOR TURNING POLE ENDS

R. A. Hicks, Technical High School, San Jose, California

An order came to us a while ago to manufacture a large number of wooden axles to be used in the lower grades of the city's schools. To turn the rounds on the end of these axles in the lathe would have been a task that would take a very long time. The jig described herein was, therefore, devised and the job that would have taken weeks to do on the lathe was done in a couple of days on the shaper. This jig is made of hardwood throughout. The various parts were made to fit and operate snugly.

It is possible to turn forms on the end of any shaped pole. All that is necessary is to grind the form cutters for the shaper and insert the proper sleeve for the shape of the material to be worked.

Following is a description of this jig and how to use it: Fastened to the base which has angled gibs on each side, and sliding in slides which are fastened securely to the shaper table and so adjusted that the center comes directly on the center of the collars, are two uprights which support the two bearings *B* in which the form sleeve *A* rotates freely but without play. Sleeve *A* is held in place with flange *C* which may be removed to change the form sleeve when occasion calls for it. Another important item is the location of the center point directly in the center in the bottom board. This may be a nail projecting about ⅛ in. and sharpened to a point.

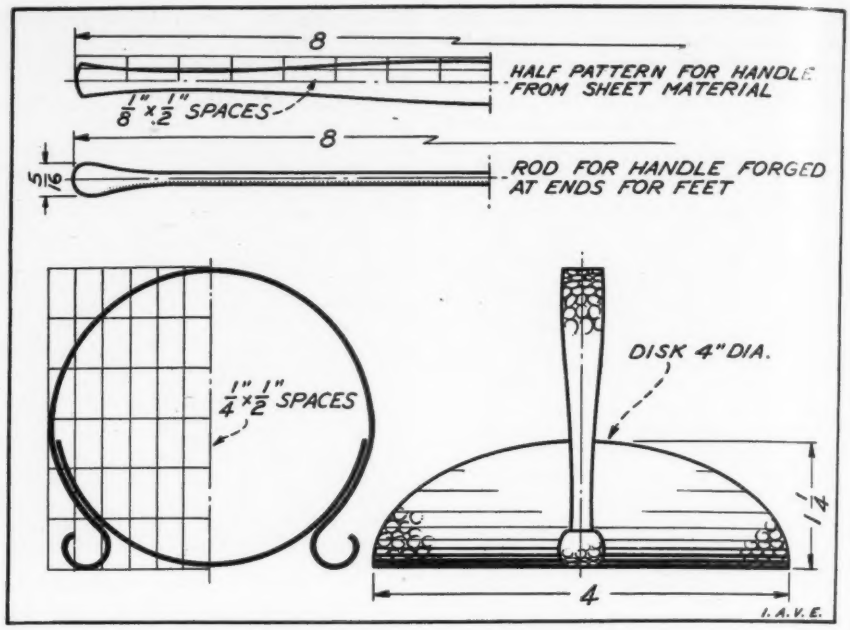
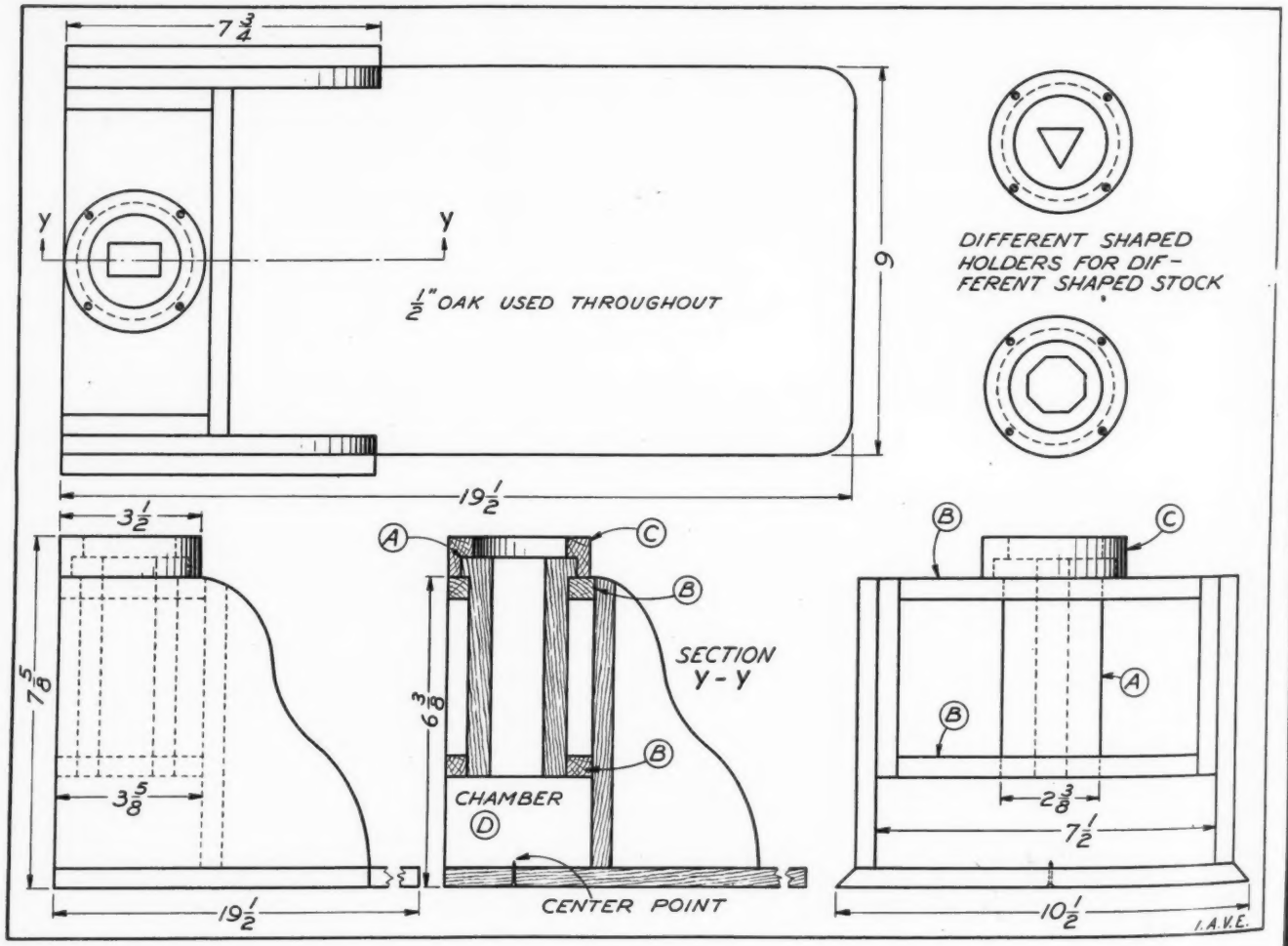


Fig. 2. Details of a simple cigarette basket



Jig for turning pole ends

The shaper cutters rotate in chamber *D*, so by constructing this chamber solidly of good material, the operator is protected to a great extent. Of course, the opening in the sleeve *A* must just fit the stock closely enough that the stock may be put in and taken out without binding.

Assuming we have a great number of rectangular axles on which we must turn a 2-in. round on each end to receive a small wheel, the diameter being determined is adjustable by placing a stop on the table to stop the forward motion of the whole jig. The work is started by drawing the jig away from the cutters and placing a piece of stock in sleeve *A* and pressing it down on the center point, and pushing the jig on to the cutters. Then it needs only to be rotated once either counterclockwise, or with the cutters. We found that by cutting backwards a smoother job was accomplished.

This jig was found very handy in doing several jobs, such as map-pole finials, finials for curtain rods, axles for toys, and anything that is of circular cross section to be turned on the end of any kind of pole.

FORGE

Verrol R. Conklin, High School, Hastings, Michigan

Many shops would be benefited by the addition of a forge, while the necessary funds are not available to purchase one. To these shops, the one described herewith would, no doubt, be of interest, as it can be constructed in the school shop at a moderate cost.

The finished product has the appearance and the performance of a factory-built job. The blower is made of a discarded vacuum cleaner, which can be purchased at reasonable prices from the local junk dealer.

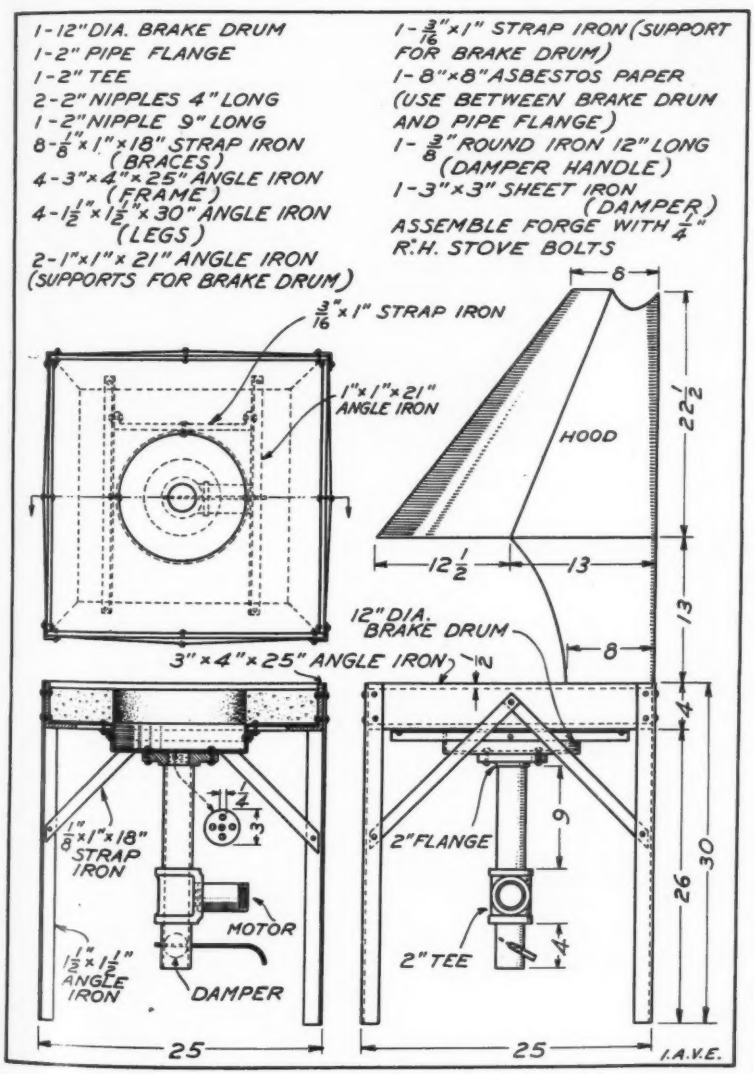
When the forge has been completed according to the drawing, the fire pot is shaped out of fire clay or out of boiler refractory cement.

The motor is run at full speed at all times, and the damper controls the draft by just letting out the air at the bottom when it is not wanted for the fire.

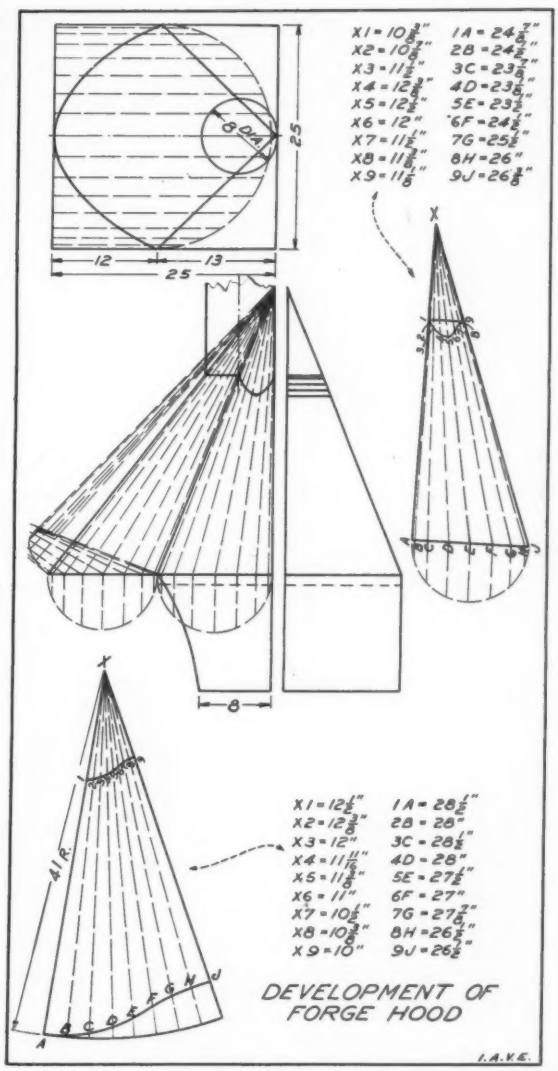
DOUBLE WOODWORK BENCH

J. K. Sowers, Miami, Florida

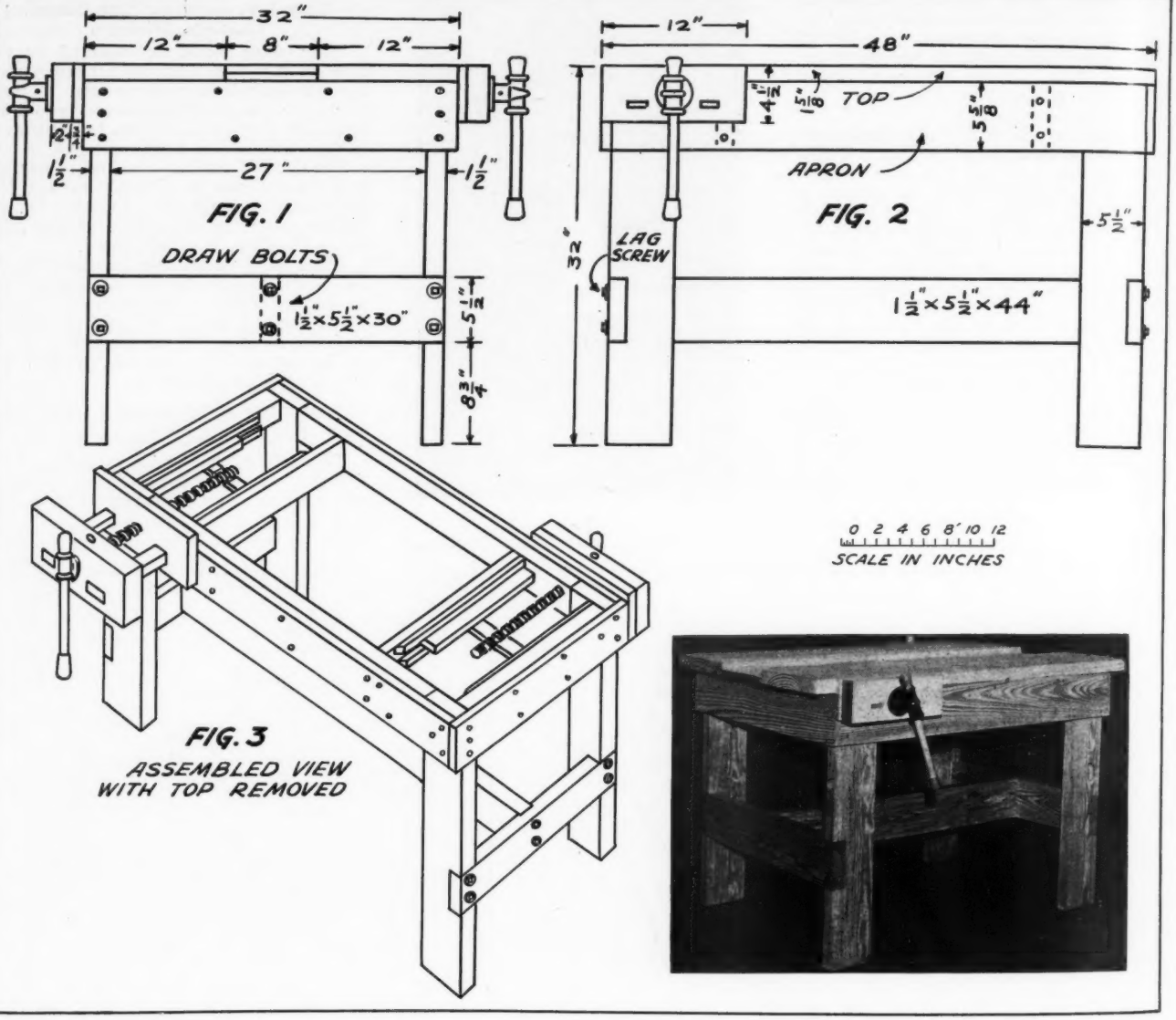
Owing to a considerable extension of our industrial-arts work the past year, it became necessary to equip a number of new shops



Details of forge



Development of hood



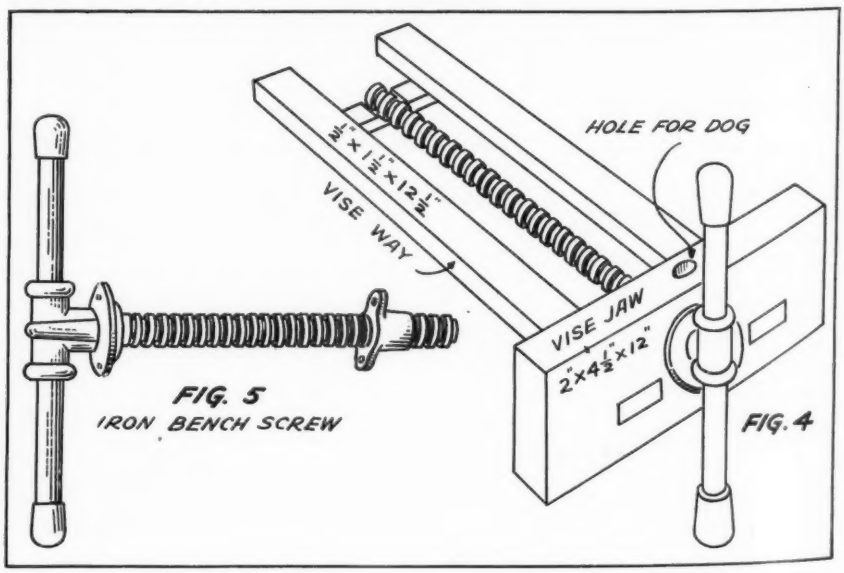
out of a limited budget. One of the largest items of expense in this type of equipment is the benches. Because of the need for practicing extreme economy, we had to make our own benches.

The benches were made out of yellow pine with the exception of the vise head, vise faceplate, and the vise ways. The vise head and vise plate were made of hard maple, the vise ways of oak. The iron bench screw which forms the basis of the vise is the ordinary screw that carpenters use in making up their workbenches. These bench screws come in ¾-, 1-, and 1¼-in. diameters. We used the 1-in. size vise screw.

Later on a similar bench of smaller size, with changes necessary to adapt it to home use was designed and put in blueprint form, and now forms one of our optional problems in advanced shop work.

The working top of most of the benches consisted of a board 1⅝ by 12 by 48 in. In some of the schools however the tops were built up as shown in Figures 10 and 11. This, of course, makes a more durable top.

Many of the men preferred a flat-topped bench without a projecting tool rack. This



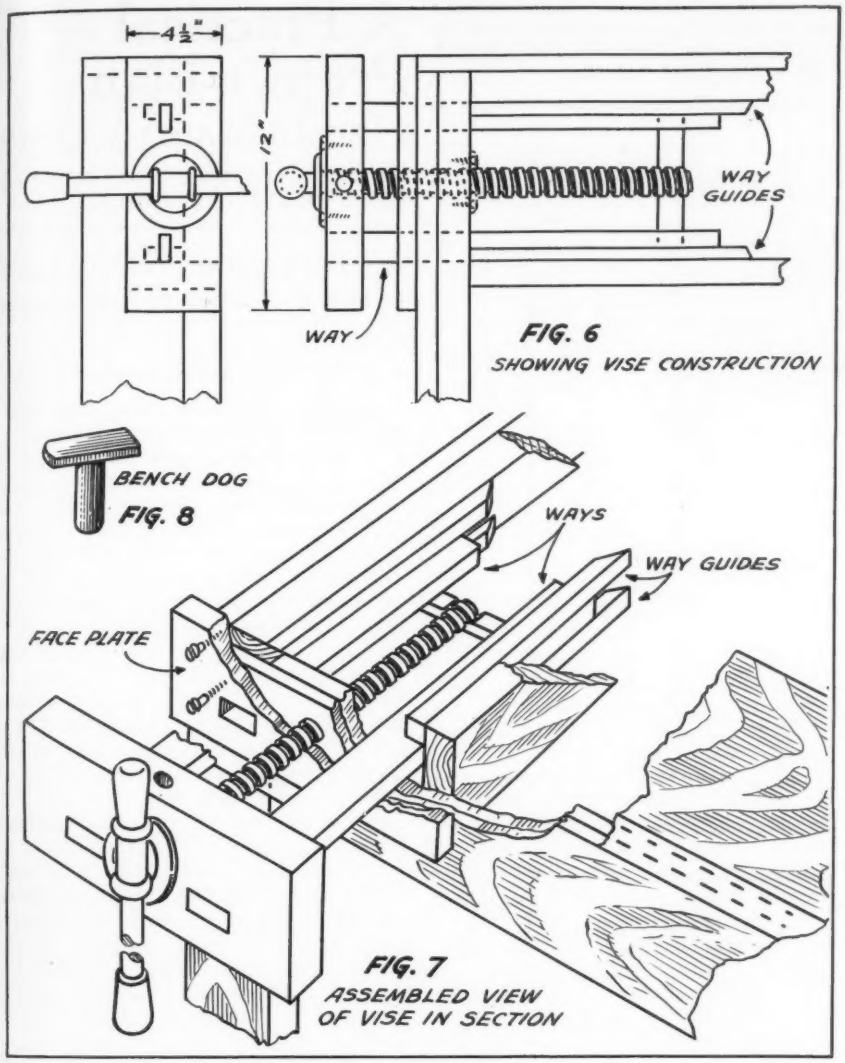
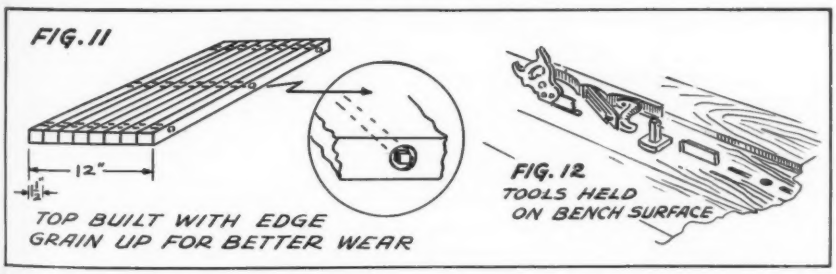


FIG. 6
SHOWING VISE CONSTRUCTION

FIG. 8

FIG. 7
ASSEMBLED VIEW
OF VISE IN SECTION

For Figs. 9 and 10 see page 300



type of bench is shown in Figure 12, the holes for the tools having been cut directly into the board forming the well of the bench. In other instances an elevated tool board and holder was used. Even these were made removable. This type of tool holder (see Fig. 9), serves to separate the bench in two equal parts giving to each boy his own working space and some measure of seclusion.

The dimensions given are those usually used for junior- and senior-high-school benches. Other dimensions may, of course, be used if desirable. The end rails and cross brace must be kept high enough from the floor to admit of easy sweeping.

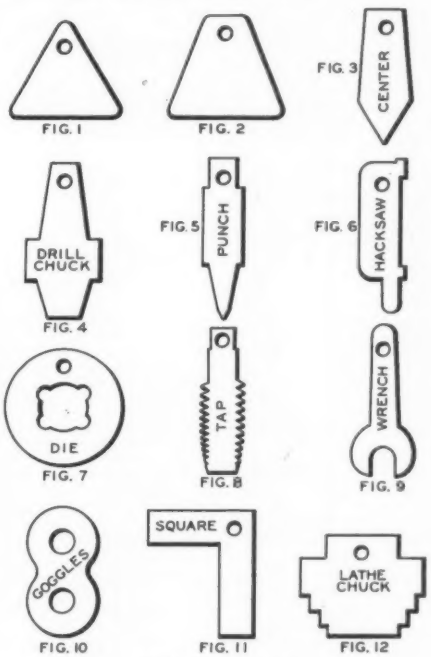
One of our teachers found that the regular vise handle supplied is too long and admits of too much leverage in the hands of ambitious young America. These handles may, therefore, be shortened to about 8 in.

TOOL TAGS THAT SAVE TIME

Edward N. Wallen,
The Textile High School,
New York City

Most tool-checking systems involve the assigning of a number of brass tool checks or tags to each individual worker or student. This method is cumbersome in a school shop because it involves keeping records of the tags issued, and there also is the problem of lost tags.

A much more efficient system has been used by the writer for the past six years with very satisfactory results. A check board is hung inside the tool crib. The board contains enough numbered hooks to accommodate the largest class that may be expected. Each student is assigned a tool number. Every tool in the crib has a tag which is hung or placed near its tool space. When a student borrows a tool, he is asked for his number. The tool tag is hung on the hook which is marked with the student's number. When the tool is returned, the tag is removed from the hook and replaced with the tool. A glance at the board shows how many tools are out and shows also when all tools have been returned. Good management includes a thorough inspection of the toolroom for missing tools at the close of each shop period; the board tells when to start the inspection.



Tool Tag Designs

The system, as outlined, is very simple but when it was first put into use, some trouble was experienced due to mixing of tool tags. Working rapidly at the close of the shop periods, the toolroom attendant would often fail to read the name on the tag and as a result tags were found to have been placed with tools to which they did not belong.

This problem was solved by changing the type of tag. Instead of using a standard-shaped brass tag with the name of the tool stamped on it, tags were made to resemble the tool that they were assigned to. Lathe-center tags were made in outline shape of a center, drill-chuck tags were given the profile of a drill chuck, and the like. The chart of tags which accompanies this article shows some of the shapes used. Tools that may be too difficult to reproduce in miniature or which are not sufficiently distinctive in outline may have various geometrical shapes assigned to them. Tags may be square, rectangular, conical, hexagonal, etc. In general the instructor should avoid these shapes unless he cannot contrive a tag shaped like the tool. The whole idea is to do away with the necessity of reading a name on a tag.

It is readily seen that a little study of the tool should suggest the proper shape of tool tag

which will best represent it. Making the tags is an interesting job for the students and does not take much time. As an added precaution it is well to stamp the name of the tool on the tag. There is no excuse for mixing tags when this system is used and the writer has had no trouble of this sort since adopting the distinctive shaped tool tags.

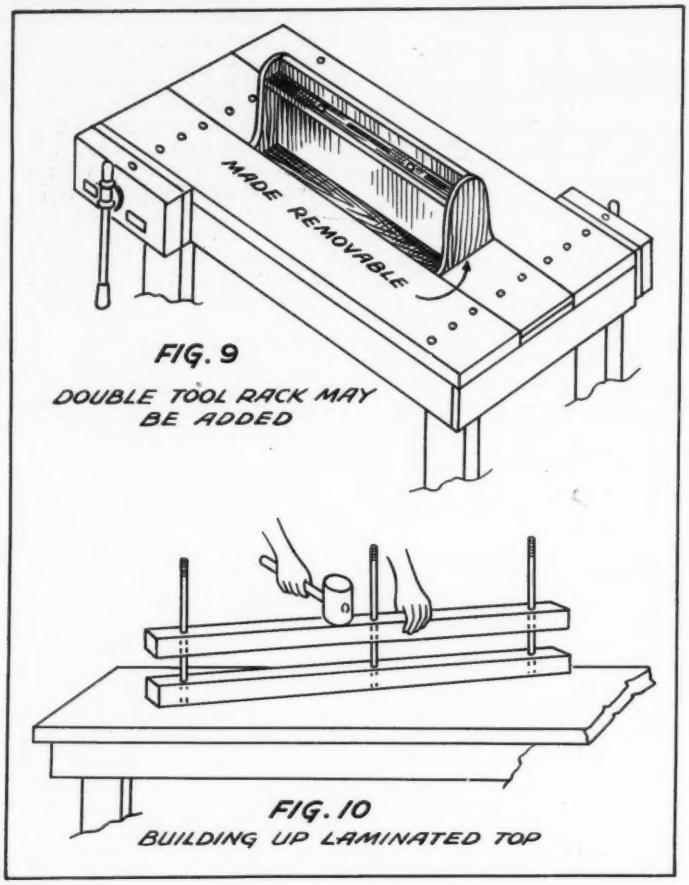


FIG. 9
DOUBLE TOOL RACK MAY BE ADDED

FIG. 10
BUILDING UP LAMINATED TOP

For description see pages 304 and 305

A Practical Project Plan

Harold Maurice Gray
Northeast Junior High School, Kansas City, Kansas

A teaching aid that will be found helpful by instructors and students alike.

Anything which is successfully completed in a minimum amount of time, and with the smallest expenditure of energy is the result of careful planning. Instructors of industrial arts who have done, are doing, or propose to do a truly effective job of teaching in their subjects realize full well the importance of planning. As an instructor of woodworking, I have seen the need for a well-organized plan for the making of a project, which will result in a minimum amount of time and effort expended and which will be of value to both the student and teacher. As a result, I have devised the plan sheet here shown as one method which seems to work very successfully when it is properly used.

While the plan sheet has been designed for use in the woodworking shop, it may be easily adapted to other subjects as well, such as metalworking, home mechanics, and the like. It is suggested that each plan sheet be made out in duplicate by the student. The original sheet is given to the instructor for his file for reference, and the duplicate sheet is the property of the stu-

PROJECT PLAN SHEET

Student's Name _____ School _____ Grade ____
Project _____ Instructor _____ Grade ____
Date Started _____ Date Finished _____ Time ____

Bill of Materials

Lumber

Description	Kind of Wood	No.Pcs.	T	W	L	No.Bd.Ft.	Cost Bd.Ft.	Total Cost

Miscellaneous Materials

Kind of Material	Quantity	Cost Per Unit	Remarks

Cost of Project _____ Date Payed For _____

Procedure

1. _____ 16. _____
2. _____ 17. _____
3. _____ 18. _____
4. _____ 19. _____
5. _____ 20. _____
15. _____ 30. _____

Tools

1. _____ 11. _____
2. _____ 12. _____
3. _____ 13. _____
4. _____ 14. _____
5. _____ 15. _____
6. _____ 16. _____
7. _____ 17. _____
8. _____ 18. _____
9. _____ 19. _____
10. _____ 20. _____

Sketch of Project

Instructor's Remarks

A Practical Project Plan

dent, and will be used by him at his bench while he is working on his project. If a notebook is used, it is suggested that it be pasted in this notebook.

At the top of the sheet is a place for the student's name, the last name being placed first for convenience in filing the sheets in alphabetical order. Then the name of the school and the school grade is filled in. The name of the project and the name of the instructor, and the starting date are next written down. The space for the grade is left blank until the project is finished, at which time the finishing date is entered after which the instructor enters the grade which the student has earned, and figures out the amount of time it has taken to make the project.

Before the student starts on the project he enters all items needed in the spaces provided in the bill of materials. Under *description* are entered the names of the parts, such as leg, top, side, and the like. When all the items have been accounted for, the total cost of all lumber used may be added and placed at the bottom of the total cost column.

Next the form for *Miscellaneous Materials* must be filled out. Such things as upholstering items, hinges, finishing materials, and the like are listed under this heading. The cost per unit, refers to the cost per yard, per gallon, or the like, and the total cost may be found and placed in the column provided. The total cost of the miscellaneous materials may be found by totaling the total cost column and placing it at the bottom of the column. The entire cost of the project is then found by adding the total cost of all lumber to that of the miscellaneous materials.

The student is asked in studying the blueprint or drawing of the project he is going to make to list all the things he must do to make the project. After this has been done and has been checked by the instructor, the student must rearrange all of these things into the proper sequential steps or in correct order to be used in making the project. After this has been checked by the instructor, the student places these things on his plan sheet under *Procedure*.

Then the student lists all the tools and machines in the space provided. Next he makes a sketch of the project either in three views or as a one-view pictorial sketch. All important dimensions must be given.

In the space provided for remarks or suggestions by the instructor, are written such comments as the teacher wants to make to the pupil concerning anything on the sheet. Then the instructor signs his name, and the student is ready to start the work.

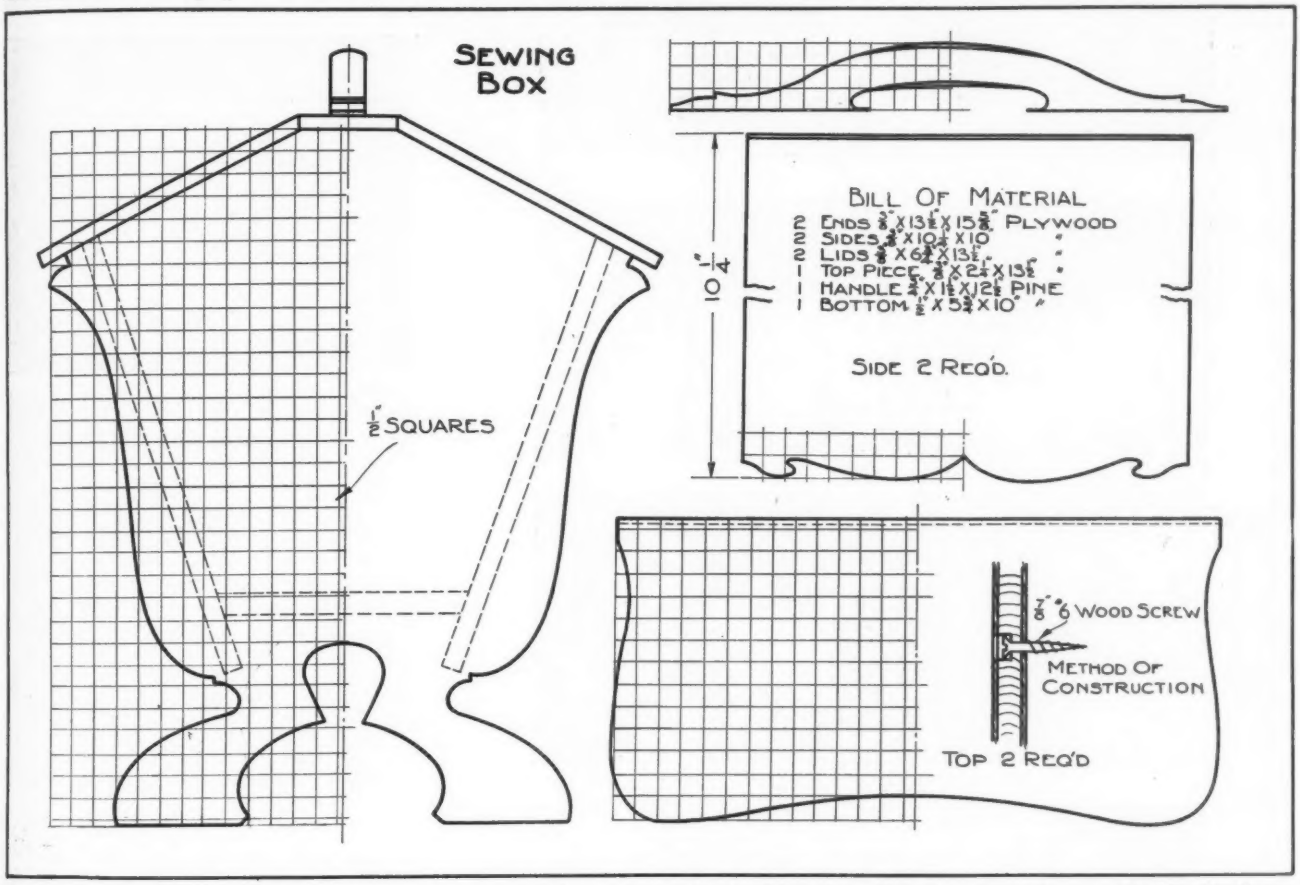
The filling out of this project plan does not take much time, but it greatly aids the student in thinking out just what is to be done, and the correct steps he is going to take in doing it, and makes for greater efficiency in performing the tasks to be done. Economy in the use of materials also accompanies the well-organized plan.

SEWING BOX

C. R. Wells, Yankton, South Dakota

This sewing box is a very simple practical project that will interest every boy taking woodwork.

The box is made almost entirely of plywood. After half patterns have been drawn on thin wood or heavy cardboard, the two corresponding pieces of plywood are tacked together and the design traced upon them.


SEWING BOX
1/2 SQUARES
BILL OF MATERIAL
2 ENDS 3/8 X 13 1/2 X 15 3/8 PLYWOOD
2 SIDES 3/8 X 10 1/2 X 10 "
2 LIDS 3/8 X 6 1/4 X 13 1/2 "
1 TOP PIECE 3/8 X 2 1/2 X 13 1/2 "
1 HANDLE 3/4 X 1 1/2 X 12 1/2 PINE
1 BOTTOM 1/2 X 5 3/4 X 10 "
10 1/4
SIDE 2 REQ'D.
7/8 6 WOOD SCREW
METHOD OF CONSTRUCTION
TOP 2 REQ'D

The pieces may be cut with the band saw and smoothed with the spindle sander, or they may be cut out with a turning saw and sanded by hand. All edges should be sanded slightly to prevent the veneer from splintering. The cabinet is held together by screws which are counterbored and the holes filled with water putty. In cutting out the sides, care should be taken so as not to have the screws holding in end grain of the core. Either a butt or surface hinge can be easily used.

A sewing box of this type may be stained dark and the edges lacquered so as to hide the core wood, or they may be lacquered to suit the individual's taste and the lids and ends decorated by adding transfers.

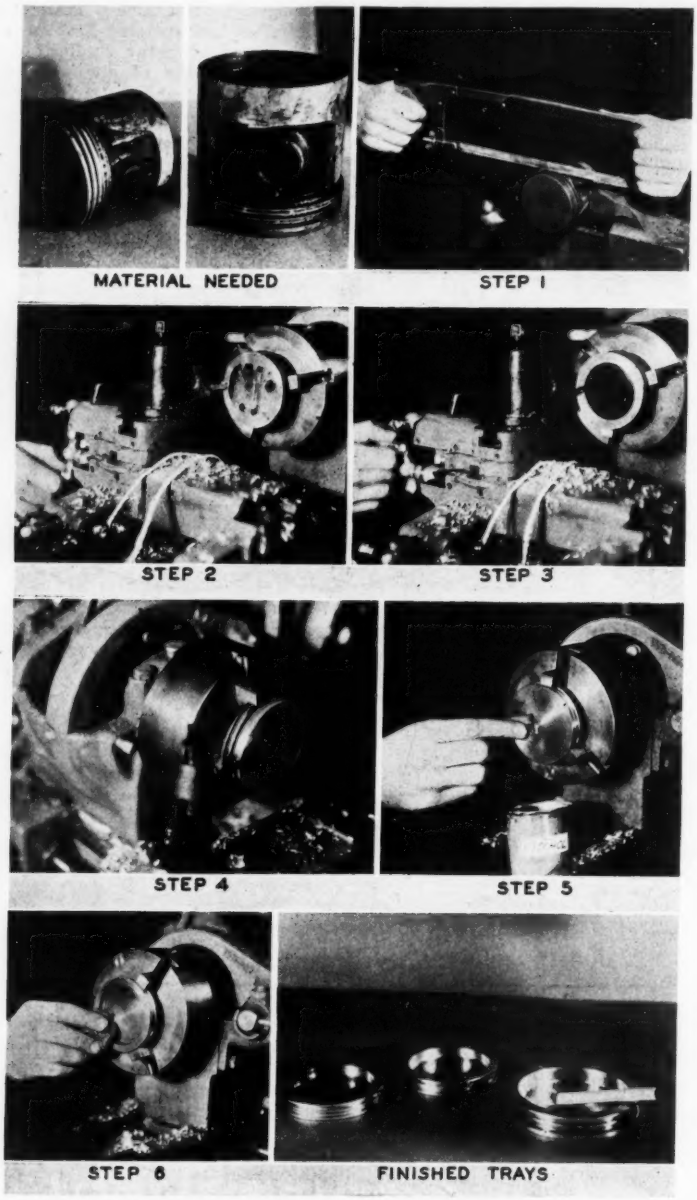
PIN OR ASH TRAYS

Don L. Olson, Public Schools, Dawson, Minnesota

Material: Ford V8 or Model A aluminum pistons, procured by the students from some wrecking concern for very little or perhaps no cost at all.

Step 1. With 18-point hack saw remove the skirt from the piston. Pry out the old oil and compression rings. Scrape off all carbon from the top of the piston, so that the top may be placed snugly against the jaws of the lathe chuck.

Step 2. Face off the front and inside of the tray. Speed of spindle about 500 r.p.m. depending upon the diameter of the work. Tool bits for cutting aluminum usually have more rake on both front and side than for steel. The edge of the tool should be rounded. If chatter occurs, decrease the radius of the tool point.



Step 3. Reverse the project and clean off the face. Be sure the tool bit is carefully honed before starting the finishing cut.

Step 4. If necessary grind a cutter to fit the ring grooves or use the cut-off tool, grinding the back rake to about 15 deg. and only 4- to 5-deg. front clearance. Cut the middle partition smaller than the others. Shim out the tray if the chuck jaws project too far. Reverse when necessary to finish cleaning out the grooves.

Step 5. Smooth and remove sharp corners with emery cloth. Alcohol is very useful to use on the emery cloth to keep the aluminum from filling up the surface. Long narrow strips can be used to clean out the grooves. Do this polishing at 1200 r.p.m.

Step 6. Use No. 2/0 steel wool for the final polishing. Finished trays can be used as pin or ash trays. They can be made to "nest" together very neatly if one cares to make more than one.

Time required: A one-hour project.

Skirts are saved, melted, and cast into forms for other turned projects.

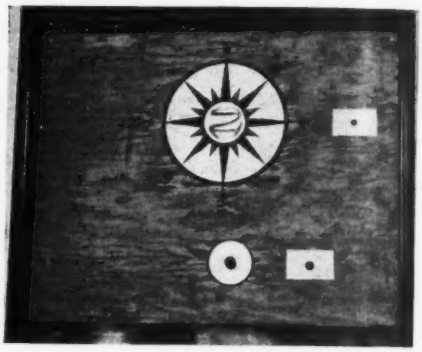
ELECTRIC WEATHER VANE

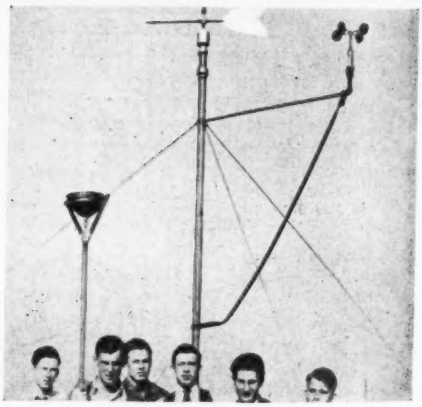
Leo J. Roedl, Northeast High School, Kansas City, Missouri

Correlation between the industrial-arts department of a school and the academic department has always been desirable. This problem, "Electric Weather Vane," was designed and executed with the co-operation of the drafting department and the physiography club of the science department. This club is now using it in conjunction with their work in studying weather conditions.

The machine is simple in its construction and may be made out of odds and ends, generally found around the average metal shop. The other pieces were brought in by boys working on specific parts.

In constructing this problem, it is not necessary to follow the drawing implicitly or use the parts listed. A great deal of variation may be allowed in design and construction. The size is also optional.



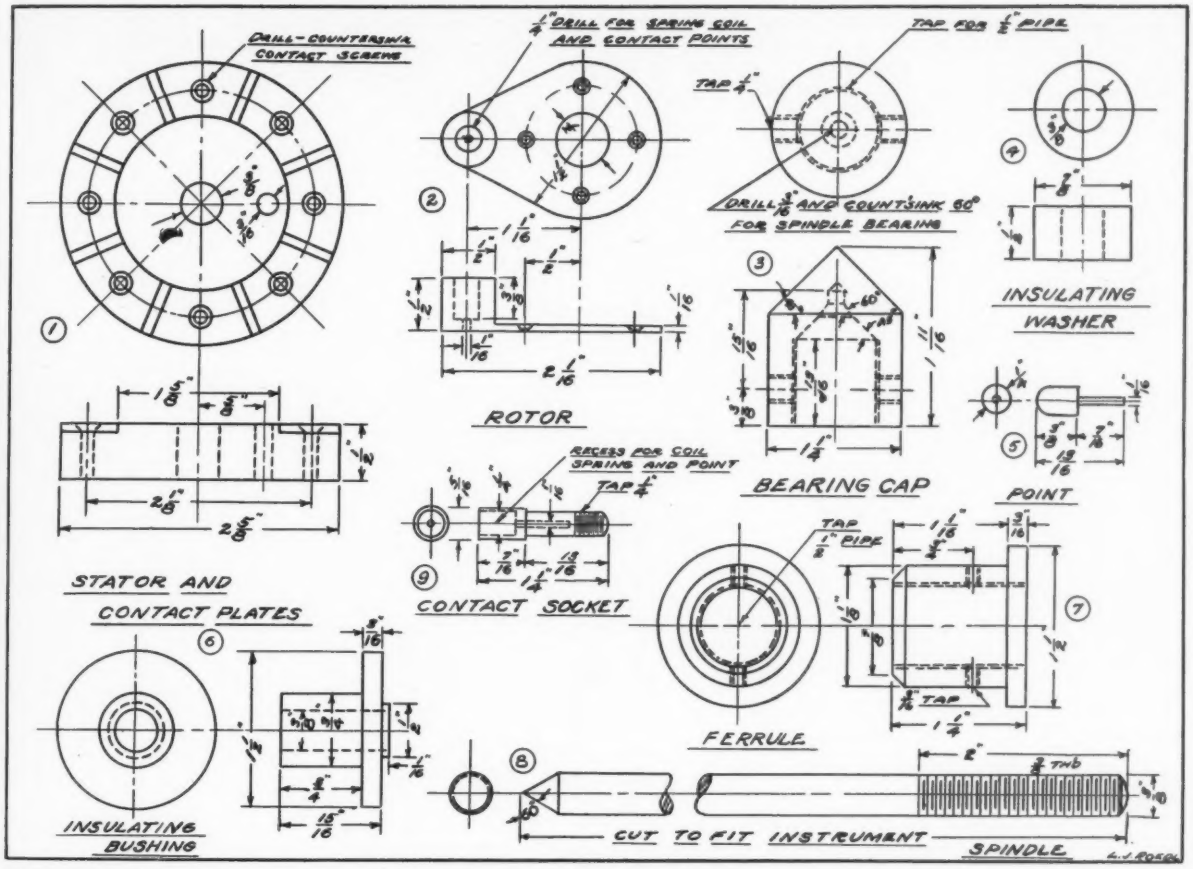


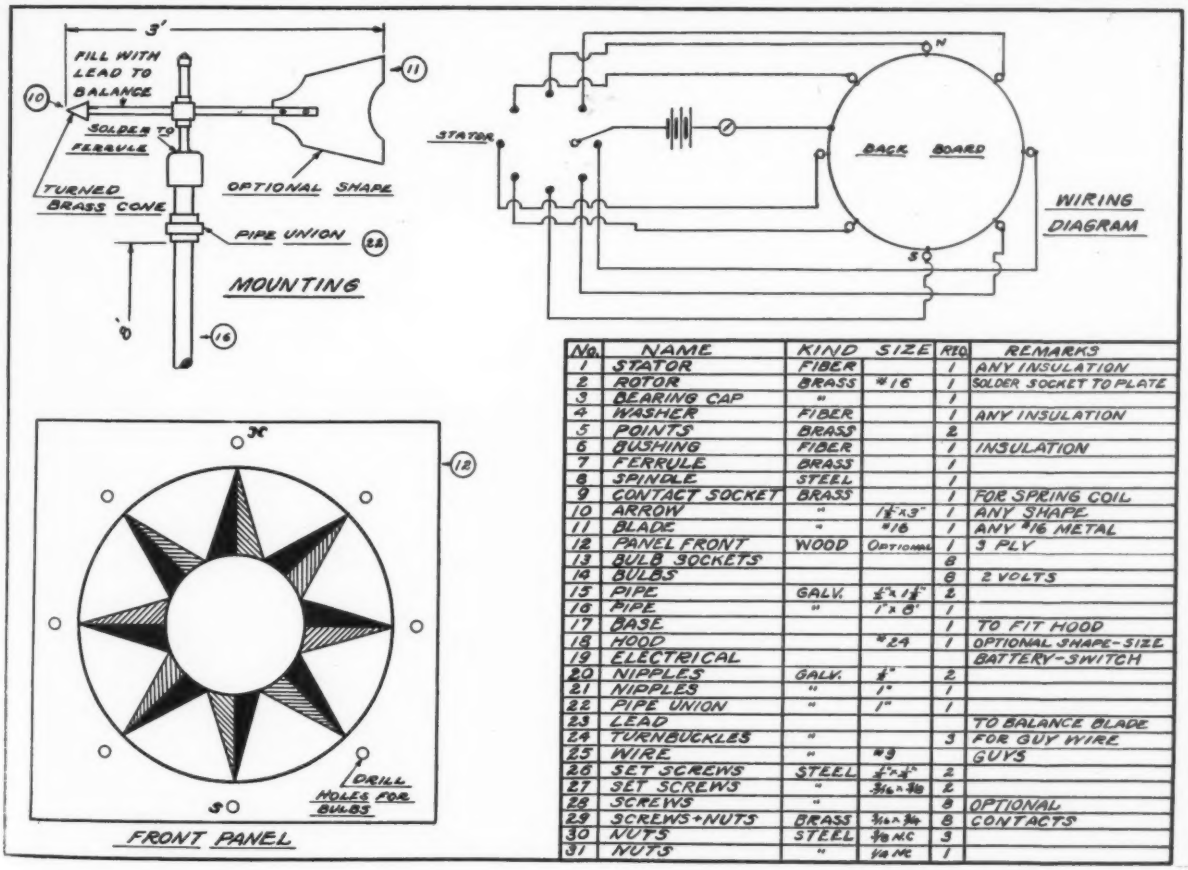
The weather vane in use

The rotor, part No. 2, is made of two pieces of brass. The socket is soldered onto the plate. This makes simple construction of an otherwise difficult plate. Extreme care must be exercised in mounting this piece as it must be in line with the arrow and then in line with the north contact point.

The stator, part No. 1, is made of fiber, but other insulating material may be used. The contact plates are brass. These plates may be so close together that when the rotor contact point crosses from one to the other, two lights will flash on the panel board. This is highly desirable as it will show the wind direction between the cardinal points, thus giving sixteen directions.

No definite dimensions are given for the cross arm upon which the blade and arrow are mounted. This must be worked out by balancing with lead inside of the pipe holding the arrow. Lead was weighed out and poured into the pipe. The remaining difference was adjusted by turning the pipe in or out, as the case may be, in the cross connection. This center connection was then soldered or fastened with a setscrew. It should not be allowed to be loose as the wind will cause it



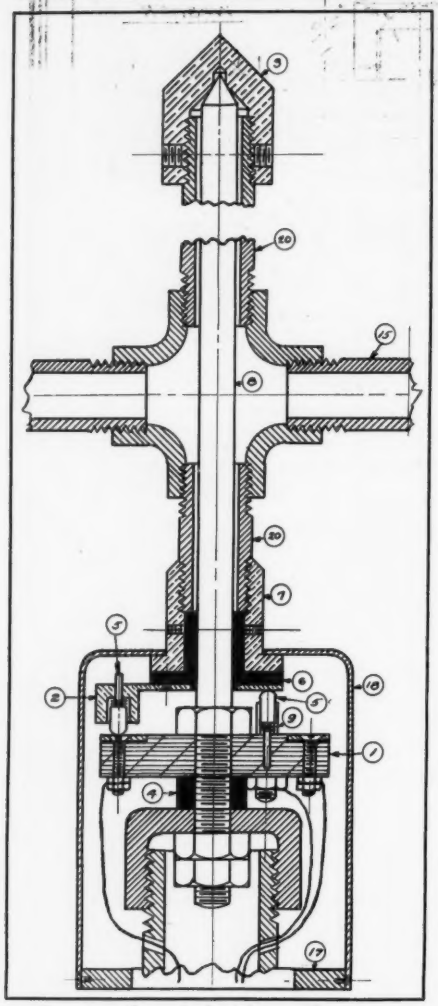


No.	NAME	KIND	SIZE	REQ.	REMARKS
1	STATOR	FIBER		1	ANY INSULATION
2	ROTOR	BRASS	#16	1	SOLDER SOCKET TO PLATE
3	BEARING CAP	"		1	
4	WASHER	FIBER		1	ANY INSULATION
5	POINTS	BRASS		2	
6	BUSHING	FIBER		1	INSULATION
7	FERRULE	BRASS		1	
8	SPINDLE	STEEL		1	
9	CONTACT SOCKET	BRASS		1	FOR SPRING COIL
10	ARROW	"	1½"x3"	1	ANY SHAPE
11	BLADE	"	#16	1	ANY #16 METAL
12	PANEL FRONT	WOOD	OPTIONAL	1	3 PLY
13	BULB SOCKETS			6	
14	BULBS			6	2 VOLTS
15	PIPE	GALV.	½"x1½"	2	
16	PIPE	"	1"x8"	1	
17	BASE			1	TO FIT HOOD
18	HOOD		#24	1	OPTIONAL SHAPE-SIZE
19	ELECTRICAL				BATTERY-SWITCH
20	NIPPLES	GALV.	½"	2	
21	NIPPLES	"	1"	1	
22	PIPE UNION	"	1"	1	
23	LEAD				TO BALANCE BLADE
24	TURNBUCKLES	"		3	FOR GUY WIRE
25	WIRE	"	#9		GUYS
26	SET SCREWS	STEEL	¼"x¼"	2	
27	SET SCREWS	"	5/16"x3/8"	2	
28	SCREWS	"		8	OPTIONAL
29	SCREWS+NUTS	BRASS	5/16"x3/8"	8	CONTACTS
30	NUTS	STEEL	5/16 NC	3	
31	NUTS	"	1/4 NC	1	

Details of weather vane designed by Leo J. Roedl, Kansas City, Mo.

to turn and thus upset the balance of the instrument. The blade is optional in shape. A double one may be employed. It has a steadying effect and may be used to advantage. An ornament may also be used on top of the bearing cap such as the school letter or other design.

The hood is optional in size but must be large enough to cover the mechanism. It may be spun or made in two parts. It is soldered to the ferrule to make it waterproof. The base for the hood is turned out of insulating material. The closer it fits the pipe the less chance for water and dust to enter. It must



Cross section of electric weather vane

turn with the hood around the large pipe, so friction must be carefully avoided.

Notice on the assembly how the large pipe is drilled to receive the wires. If the pipe union is used, as shown below the hood, it will be possible to do all of the wiring permanently before mounting. It also makes it possible to hold the instrument on true north without turning to fasten it. If coupling is used, it is suggested that setscrews be used as it is difficult to mount on true north and have the instrument rigid at the same time.

The mounting of the pole is left to the individual school. Each becomes an individual case. Cement may be used or flanges employed with the use of any wire. Any method that will hold the pole perpendicular will be satisfactory.

The wiring used here shows the use of dry cells. In schools where a.c. current is used throughout the day, it is suggested that a bell transformer be used instead. This in no way will change the wiring diagram of the machine.

The front-panel board offers an opportunity for the art department or the drafting department to design a highly ornamental compass. The center may contain the emblem of the school and the pointers may be worked out with a color design.

TILT-TRIPOD HEAD

H. C. Rose, Public Schools,
West Allis, Wisconsin

A tripod or some equivalent rest for the camera is necessary in taking time and bulb exposures. Such exposures are desirable when using a small stop in order to obtain great detail and sharpness in all parts of a picture, and they are absolutely necessary when the light is too dull for a snapshot with the lens at its largest stop.

With this in mind it becomes evident that many, or even most pictures that the industrial-arts teacher makes would necessitate the use of a tripod. The attachment for the tripod which the writer has found most valuable over a period of years is shown in Figure 1. This tilting head makes it possible to focus the camera at any angle so that it is quite easy to photograph a group of small objects. With the objects laid out on the floor or on a table top, the tripod may be set directly over them with the camera focused straight downward or at any angle desired. With the proper camera tripod and tilt top it is as easy to photograph a shop project, as it is to make a snapshot out of doors. Very uniform results may be obtained because once the correct exposure is determined, even though it may take several minutes, the same setup can be made again with comparable results.

The parts for the head may be made of brass or other metal of similar qualities. Two pieces of 16-gauge material should be cut as shown in Figure 2. These are then marked and bent over a suitable form. If two or three are being made at the same time (these tripod heads are very useful to hold the floodlight reflectors also) a piece of stock of the proper size can be chamfered on the corners and used to form all of the pieces. The bends must be accurately made if the head is to tilt without binding.

A ¼ by 1½-in. stove bolt, with the head filed flat and fitted with a wing nut, provides the means of tightening the working parts so that they can be set rigidly at any desired angle. The ⅜ by 1-in. piece of pipe, through which the bolt is tightened, acts as a distance piece and prevents the parts from being forced out of shape.

The washer shown on the top half of the assembly is not a necessity but the added thickness makes it possible to fit the screw more accurately. The same construction may also be used to hold the socket for the photo flood or flash bulbs.

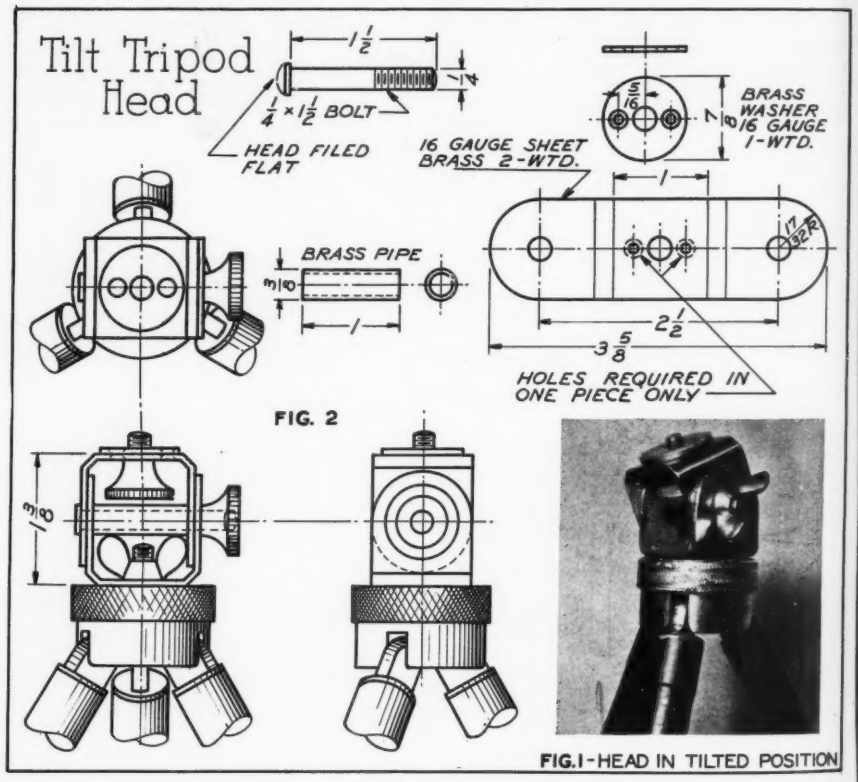


FIG. 2

FIG. 1 - HEAD IN TILTED POSITION

♦ An unknown donor has pledged himself to an endowment of $400,000 to the Rochester Athenaeum and Mechanics Institute, Rochester, N. Y., provided $600,000 can be raised by other means. The drive to raise this amount will close December 31, 1940.

The new Department of Publishing and Printing at the institute will be one of the departments that will benefit from this drive. The printing department was started in 1937 and is one of ten departments of this old Rochester educational institution, which was founded in 1829. A two-year post high-school printing course is offered on a professional level.

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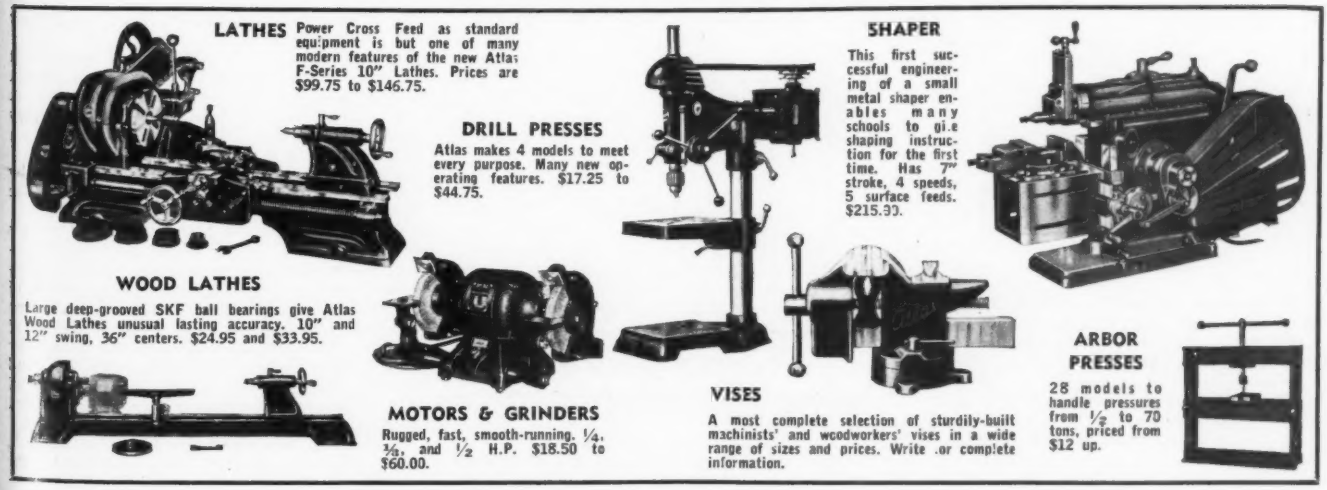
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Answers to Questions

Effects of Oxidizing Fire

Q.: What are the effects of an oxidizing fire or iron? — *H. M. S.*

A.: An oxidizing fire contains more oxygen than is necessary to complete combustion. If iron is heated in such a fire, the metal will burn more readily and at a lower temperature than if it were in a neutral atmosphere. Therefore, when heating iron or steel, a neutral fire should be used, that is, one with just enough oxygen to completely consume the fuel. There is an exception when heat treating material where the danger of decarburization is present. Under such conditions, a slightly oxidizing fire may be used. Some of the excess oxygen will then combine with the iron forming iron oxide or scale which reduces the size of the metal. If the metal is worked with this scale on, surface defects will be produced in the finished product. — *Geo. Coleman.*

Effects of Sulphur in Coal on Iron

Q.: What are the effects of sulphur in coal on iron?

A.: The theory has been that sulphur, when combined with iron, causes the metal to be brittle when heated red hot. This is known as red shortness. As iron will absorb impurities when heated above its critical temperature, fuels containing sulphur should not be used. This older theory is now thought to be erroneous and it is thought that within reasonable amounts sulphur is not injurious to iron. If iron ore, used in the making of steel, contains too much sulphur, manganese may be added to nullify any evil effects. — *Geo. Coleman.*

Personal News

WILLIAM L. HUNTER DIES

The news of the sad ending of William L. Hunter will come to many of his friends and admirers as a distinct shock. Every teacher has a following among his students, but Professor Hunter was loved by everyone of the many students who came in contact with him.

William L. Hunter

He was born March 21, 1896 at Diko, Iowa. After graduation from the high school in Cedar Falls, he entered Iowa State Teachers College, June, 1916. During the World War, he spent about eighteen months as a member of the aviation service of the United States Navy. He received his bachelor's degree from Iowa State Teachers College, Cedar Falls, Iowa, in 1919, and an M.S. degree from Teachers College, Columbia University, New York City, in 1926.

He taught industrial-arts work at the University of Iowa, Iowa City, from 1919 to 1925. Then he acted as editorial assistant on the *Industrial Education Magazine*, Peoria, Illinois, for two years doing part-time teaching at the Bradley Polytechnic Institute at the same time.

Since September, 1928, he has been teaching at Iowa State College, having been promoted to the position of head of the industrial-arts department in 1931.

He was an indefatigable worker and is known as the author of several shop tests, many reports and studies, and numerous magazine articles.

He held membership in the National Educational Association, the American Vocational Association, the Western Arts Association, the Manual Arts Conference, and in several professional organizations in Iowa.

He was a member also of Phi Delta Kappa, Iota Lamba Sigma, and Epsilon Pi Tau.

He was found asphyxiated in his automobile in the garage at his home on May 23. He is survived by his mother and two minor daughters, his wife having died about two years ago.

♦ JAMES F. JOHNSON, Superintendent of the Boys Vocational School, Newark, N. J., died April 27, following an illness of nearly a year.

♦ THOMAS E. SPENCER, teacher, principal, and administrative official in the St. Louis school system for a period of thirty-seven years, died on July 2 at the age of eighty-six years. He is credited with the establishment of the first vocational training system in St. Louis, where he founded the St. Louis Vocational School, now the Hadley Vocational School, of which he was elected principal in 1927. Mr. Spencer had previously been prominent in the rural schools of the State of Missouri and superintendent of schools at Marshall, Mo.

♦ The American Type Founders Library of Printing, founded thirty years ago by Henry Lewis Bullen, and housed since 1936 in the main building of the Columbia University Library under the supervision of Dr. C. C. Williamson, director of libraries, was dedicated on June 26 to public use.

♦ J. D. HOPKINS, formerly at the Jefferson Senior High School, Roanoke, Va., has been appointed principal of the Trade and Industrial School, Abingdon, Va.

♦ SYDNEY SCOVILLE, Kenosha, Wis., has been appointed instructor of industrial-arts work at Lake Mills, Wis.

♦ MAXSON R. CRANDALL, who has been teaching industrial-arts work in the public-school system of Darien, Conn., for the past ten years, has been promoted to head of the industrial-arts department.

♦ Andrew D. Althouse, Supervisor, Department of Vocational Education, Detroit, Mich., took part in the recent one-day counseling program at Lincoln Park High School. Representatives of universities and industry talked on occupations and conducted conferences. Mr. Althouse spoke on the automotive and Diesel fields.

♦ Carl E. Karlstrom, Supervisor, Department of Vocational Education, Detroit, Mich., was a guest speaker at Fordson High School on May 2. He offered counseling information in his talk, "Jobs for Youth" which was presented to the Fordson High School senior boys.

♦ Albert Lloyd Colston, Principal of Brooklyn Technical High School, Brooklyn, N. Y., was awarded the degree of L.L.D. at the 84th commencement of Polytechnic Institute of Brooklyn on June 14.

♦ ALBERT G. BAUERSFELD was appointed principal of the Carl Schurz High Schools, Chicago, Ill., upon the retirement of Thomas E. Johnson who had been principal at Schurz since 1936.

News Notes

♦ A survey of the education of industrial-arts teachers is being conducted by a committee of the National Association of Industrial Teacher Trainers affiliated with the American Vocational Association. The survey is of four-year curriculums in industrial-arts education in teacher-training institutions of the United States, and is proceeding under the supervision of Dr. Verne C. Fryklund, of the Department of Industrial Education, Wayne University. A detailed schedule of questions has been prepared and mailed to the institutions involved in the study.

♦ Two hundred thirty-two printing students participated in the "Prize Printing Competition" sponsored by the Rochester Typothetae, Inc., and the National Graphic Arts Education Guild. The contest was held to stimulate an interest in good printing among school students in the Rochester, N. Y., schools. The contest embraced three classifications — business cards, letterheads, and title pages. In each classification there were three cash prizes and two honorable mentions.

♦ A two-year study just completed by Professor E. F. Potthoff of the University of Illinois College of Education, Urbana, Ill., has been embodied in a bulletin entitled "Simplifying the Combinations of Subjects Assigned to High-School Teachers." Professor Potthoff boils teaching subjects down to 12 major and 20 minor fields, with a total of 104 suggested combinations. The combinations are of related subjects. This allows better teacher preparation, easier and more sensible teacher selection, and better teaching in the school.

♦ On Commencement Day last June at Bradley Polytechnic Institute, President Frederick R. Hamilton announced that the Institute trustees had accepted from Charles A. Bennett, Editor of Industrial Education magazine and former faculty member of the Institute, the gift of his library on industrial education.

This library consists of about 700 books and many hundreds of pamphlets, reports, and cut magazine articles. Many of these books were used by Mr. Bennett in the research work that resulted in the writing of his two volumes on the History of Manual and Industrial Education. Some of them have been out of print for a long time and are difficult to secure anywhere at any price. The library has been collected during the past 40 years and has been extensively used by Mr. Bennett in his editorial work.

The library which will be known as the "Bennett Collection," is to be housed in a room adjoining the main library of Bradley Polytechnic Institute and will be made available for advance students in education, especially those in industrial arts, vocational education, and art education. Plans are being developed to offer the free use of this collection to research students from other colleges.

New Publications

Silk Screen Stencil Craft as a Hobby

By J. I. Biegeleisen. Cloth, 139 pages, 5¾ by 8⅝, illustrated. Price, $2. Published by Harper and Bros., New York City.

A thorough guide for the student or hobbyist in the art of making and using silk screen stencils. This process, which is used quite extensively in the printing industry, also will be found very useful in the school.

Forty Pieces of Fine Furniture

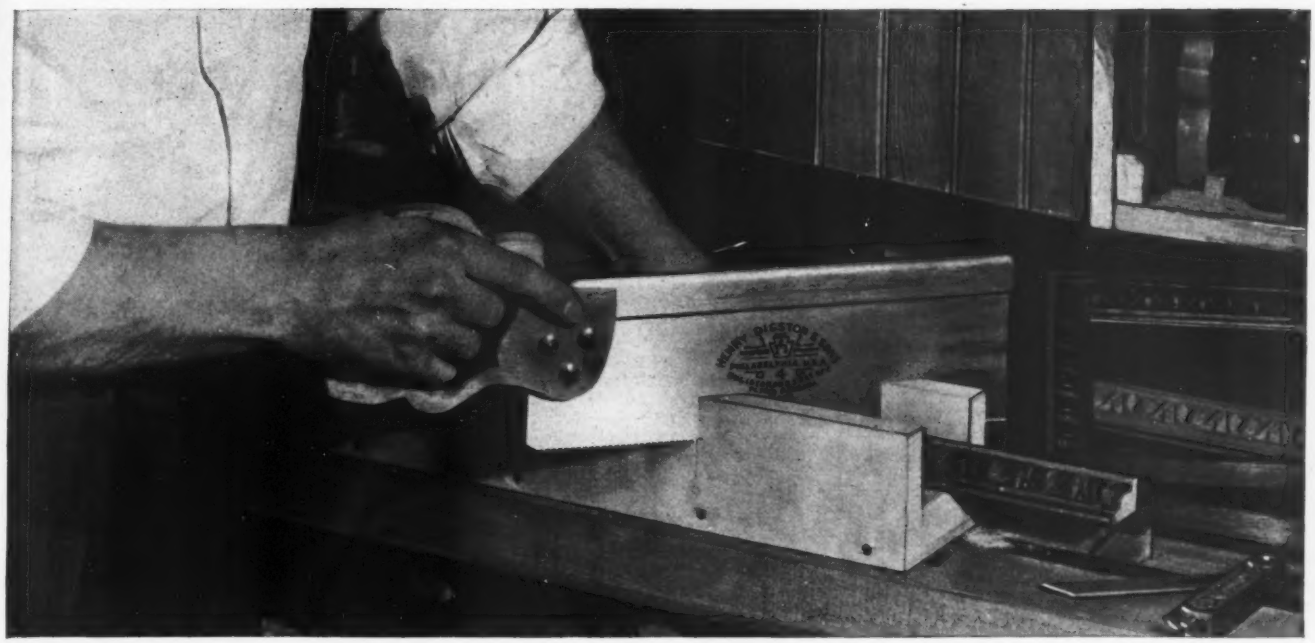
By Herman Hjorth. Cloth, 171 pages, 7⅞ by 10¾, illustrated. Price, $2.50. Published by The Bruce Publishing Company, Milwaukee, Wis.

As indicated by the title, this book presents descriptions of numerous pieces of artistic furniture. Each description is accompanied by a well-dimensioned drawing, a half tone and a bill of materials. The book also contains chapters on veneering and inlaying, simple carving, and wood finishing. The examples of furniture chosen by the author cover an exceedingly wide field and will be found helpful by the student in the school shop as well as by the hobbyist in his home shop.

The Chemical Formulary

H. Bennett, Editor-in-Chief. 1939 edition. Cloth, 638 pages, 6 by 8¾. Price, $6. Published by the

(Continued on page 16A)



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Disston, too, knows the need for quality. In 1855, the first crucible saw steel ever made in America was produced in the Disston plant. Disston Saw Steel gives you tools that are a credit to vocational training.

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Samples of Disston Hand Saw, File, and Hack Saw Charts, and educational literature will be sent to instructors on request. Ask also for Disston Refitting list for school requirements. Write to:

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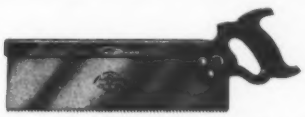
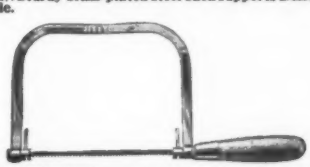


Disston No. 4 Back Saw—Handiest of all small saws. Use it for fine joinery and cabinet work. Blade of Disston Steel—hard, tough. Teeth shaped for fast, accurate cutting. Back of extra-heavy, polished steel. Beechwood handle with Disston weatherproof finish; brass screws. 5 sizes: 8" to 16" blades; 16 to 12 points.

Disston No. 2 Compass Saw—Open grip handle for easy control. Disston Steel blades, toothed to point. Taper-ground for clearance. Tempered to stand strain of curve-cutting. Applewood handle: Disston weatherproof finish; brass screws. 8 point. Sizes: 10, 12, 14, 16 inches.

Disston Dovetail Saws Nos. 68, 70, 71—For dovetailing, tenoning, model building, pattern making . . . wherever finest possible joint is needed. No. 68 (illustrated) has straight handle. No. 70, open grip handle. No. 71, same as No. 68, with handle and blade offset to permit cutting with blade flush to board. All extremely thin (.018"), with fine teeth (17 points). Sturdy brass-plated steel back supports Disston Steel blade.

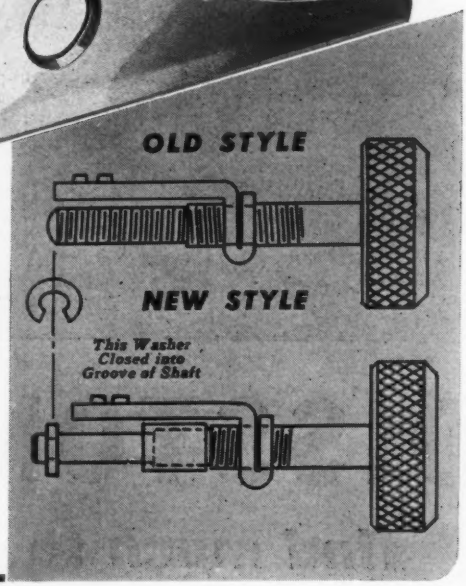


Disston No. 10 Coping Saw—Frame of Disston Steel, 4½" from tooth edge of blade to inside of back. Polished hardwood handle. Nickel-plated ferrule, machined stretchers. Blades available for cutting wood, bakelite, brass, celluloid, bone, composition board, copper, other metals.

STANLEY "Boy-Proof" BLOCK PLANE

With NEW Cutter Adjustment

STANLEY
TRADE MARK



THE new cutter adjustment on the famous Stanley No. 118 "Boy Proof" Block Plane reduces the parts of the plane to three pieces: cap, cutter, and bottom complete with adjustment locked in place. New part allows for simple replacement, eliminates thread stripping of old style cutter adjustment, cannot be lost once assembled in plane. This simple and practical plane is ideal for school shop use. It is all steel and has a low cutting angle.

Write for Catalog No. 34, describing the complete line of Stanley Tools.

STANLEY TOOLS

DIVISION OF THE STANLEY WORKS

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(Continued from page 14A)

Chemical Publishing Co., Inc., New York City.

A very large collection of recipes and formulas for making thousands of compounds, many of which are extensively used in industry. The formulas cover a very wide field and in many cases are accompanied by rather detailed explanatory notes.

Industrial Electricity, D.C. Practice

By William H. Timby. Cloth, 635 pages, 6 by 8¾, illustrated. Price, $3. Published by John Wiley and Sons, Inc., New York City.

This is the second edition of this well-known book written especially for technical schools and electrical workers. The book has been entirely rewritten. It is copiously illustrated, presented in understandable English and requires nothing further than a knowledge of simple algebra.

Instruction and Information Units for Hand Woodworking

By J. H. Douglass and R. H. Roberts. Paper, 128 pages, 8 by 10⅝, illustrated. Price, 60 cents. Published by McCormick Mathers Co., Wichita, Kans.

This book contains 29 information units and 31 instruction units. The information units embrace descriptions about forestry and lumbering, woods and their uses and where grown, reading a working drawing, making out bills of material, information on tools of various kinds, glues and gluing, cabinet hardware, finishing woods, and care of finishing materials. The instruction units cover the making of working drawings, the use and care of the various tools, the use of the various holding and fastening devices, the making of joints, the gluing of lumber, the application of hardware and the actual finishing of the project.

The book is well illustrated. An inserted test accompanies each book, for which a key is available.

Simple Blueprint Reading, with particular reference to welding and welding symbols.

Paper, 141 pages, 8 by 10½, illustrated. Price, 50 cents. Published by the Lincoln Electric Co., Cleveland, Ohio.

This book, prepared by the American Welding Society, contains not only the various welding symbols to be used on drawings, but also shows how they are applied on the actual drawings.

Since welding is finding adoption in more and more fields of industry, the information contained in this mimeographed instruction book of necessity deserves greater recognition in the drafting courses of our schools.

Forging Practice

By Carl G. Johnson. Cloth, 136 pages, 5¾ by 8¾, illustrated. Price, $1.50. Published by The American Technical Society, Chicago, Ill.

A practical book on modern forging practice covering hand forging; welding by forging; hammer forging; drop forging; upset-forging; hydraulic forging; processes of hot and cold rolling; cold swaging, pressing, and drawing; and extrusion of metals. The heat treatment of steel forging and the identification of steel also is covered.

Portland Cement

By Richard K. Meade. Cloth, 707 pages, 6⅜ by 9⅜, illustrated. Price, $10. Published by The Chemical Publishing Co., Inc., New York City.

A comprehensive book on a most valuable building material. In the introduction are treated the history of the development of the American Portland cement and the nature and composition of Portland cement. Under Manufacture are treated raw materials, proportioning raw materials, quarrying and mining, the outline process, the dry process, the wet process, crushing and grinding materials, burning kilns, fuel, cooling and grinding, power equipment, and cost of manufacture. Under Analytical Methods are treated analyses of cement, analyses of mixtures, and analyses of raw material. Under Physical Testing, inspection of cement, specific gravity, fineness, time of setting, soundness, and tensile strength. Under Miscellaneous are discussed detection of adulteration and investigation of materials.

A number of useful tables have been appended.

Association News

♦ The Western Illinois Industrial-Arts Round Table No. 3 concluded one of its most successful and enjoyed series of meetings at the last quarterly meeting held in Rock Island, Wednesday, May 3. About forty men from Moline, Rock Island, Galesburg, East Moline, Kewanee, Monmouth, Aledo, Geneseo, and Clinton, Iowa, were present.

A short business meeting was conducted by the president, J S. DuCray of Moline. Officers for the next year were elected as follows: R. S. Landon of Galesburg, president; I. P. Mitchel of Rock Island, vice-president; and Clement Williams of Galesburg, secretary and treasurer. It was voted to hold the first meeting of the next year at Galesburg.

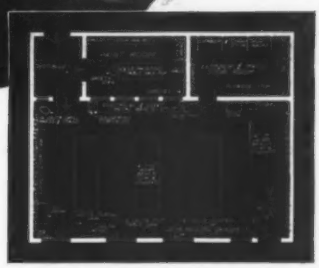
I. P. Mitchel of Rock Island acted as program chairman for the evening, and announced the following program:

Mr. C. V. Greenwood, Head of the Personal Employment Department of the Farmall plant in Rock Island discussed Apprentice Training in the Farmall plant employing 5,800 men. He praised the industrial-arts departments of the schools for sending such well-trained boys to the plant, and said that only three failures of apprentices have been recorded in the Farmall plant during the past ten years.

Among the requirements for entering apprentice training, he listed the following: Good character, good scholastic standing, previous industrial training in high school, knowledge of

(Continued on page 18A)

Low Cost Tools CAN Be Used Effectively in School Shops



A sample of the shop layouts contained in the Book "How to Plan a School Workshop." This is the layout of the shop illustrated above.

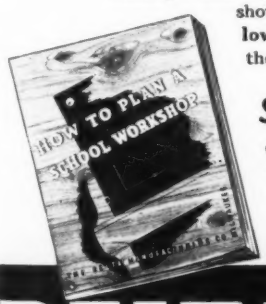
Shop Layouts Submitted By Hundreds Of Instructors Show Remarkable Progress Made In Recent Years In New Type of Tools

There has been a radical change in the type of equipment adopted for vocational education and industrial art classes. This was revealed dramatically by the entries to the Delta "Shop Layout Contest" submitted this spring by hundreds of shop instructors from schools all over the country. Actual plans of operating shops showed that the use of **low-cost tools** cuts down the original installation costs by as much as two-thirds, reduces maintenance costs, and effects valuable savings in space.

More important—it permitted the training of students on tools they would actually use after graduation—in both industrial and home work shops.

These facts are of great importance to all those concerned with the latest developments in vocational training.

One of the many actual shop photographs that appears in the new Delta Shop-Layout Book.



Send for SHOP LAYOUT BOOKLET

containing the best photographs and shop layouts of actual low-cost tool installations in schoolshops sent in the contest just closed—and giving vital facts about this new trend in shop equipment.

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Gentlemen:

☐ Please send me without obligation of any sort—a copy of the new book "How to Plan a School Workshop."

☐ Please send me a copy of the latest catalog of Delta industrial power tools for schools.

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School.....

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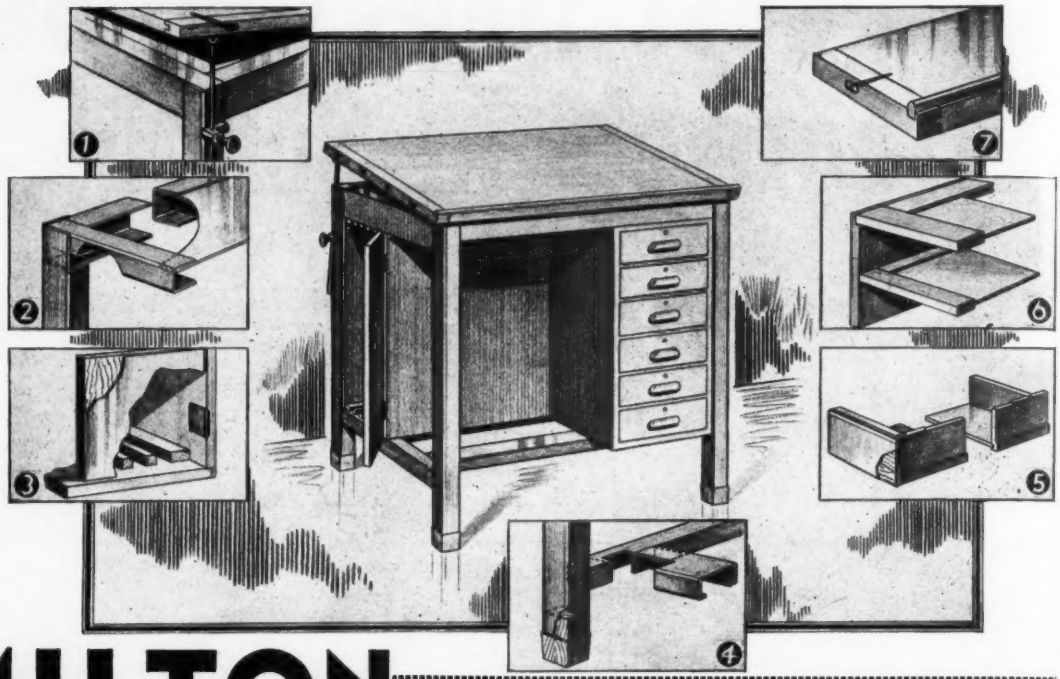
THE NEW LIFETIME DRAWING TABLE

This new type of drawing table, originated by Hamilton, is made of both steel and wood. Such duplex construction insures strength, rigidity, and long life, even under hard school usage. It is truly a "Lifetime" Table. Notice the features illustrated at the right:

1. **Combination friction and clamp type of raising device.**
2. **Heavy reinforced, and welded steel body.**
3. **7-ply door panel, covered with a steel panel. Also a smooth non-protruding hinge that is easy to dust and that will not catch clothes.**
4. **Pencil ledge on top. Strong, mortised top construction with long screws in slotted expansion holes.**
5. **Notice the wood drawer unit interior with its separating panels which make each drawer a separate unit.**
6. **Steel fronts on the drawers to prevent wear and chipping. There is a play strip on the side of drawer also which insures a good fit and a smooth running drawer under any climatic conditions.**
7. **Strong bracing of table body. Notice the steel legs, with the wood shoes to prevent floor mars.**

For further information about the new Steel-Wood Tables, send in the coupon.



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Laboratory and Vocational Furniture

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Please send me more information on the new Steel-Wood Tables.

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School and Position.....
Address.....
City and State.....

(Continued from page 16A)

mathematics, and a knowledge of foundry and metallurgy.

In conclusion Mr. Warren Langwith of Davenport showed a very interesting colored film of his trip around South America.—*L. L. Josserand, Secretary and Treasurer.*

♦ The Western Arts Association held its 45th Annual Convention in Grand Rapids, Mich., May 3–6, 1939. The program, centering around the theme "The Arts Today and America's Youth" was well attended. In addition to the several general sessions, group meetings were held. On one day the groups were divided by subjects: art, home economics, and industrial arts. On another day by grade levels: elementary school, secondary school, college, Catholic art, and a new group "The Younger Teacher." This last group reached such large proportions that the room could not accommodate all who wished to enter.

One of the general sessions attended by approximately 1,000 was presided over by Clara McGowan, president of the department of art education of the N.E.A. On this program two artists of national reputation in the field of murals and sculpture were the speakers.

Thomas Benton in covering his subject "Painting in America Today" gave an unusual program by asking for questions from the audience and in a very spontaneous way answered them instead of giving a formal lecture. He put into his method of making his contribution to the program, the same originality displayed in his murals.

Mr. Zorrah, sculptor and painter, spoke on "Sculpture for Adolescence, a Forceful Form of Expression" reviewing his experience with a small group of children on the east side of New York shortly after his arrival from Paris thirty years ago. He stated he was trying to free himself from academic traditions. He advocated handling small children as one would handle a mature artist by giving them lots of freedom. Up to the age of 15, he believes the child should be left alone to find himself, that technique should not be imposed upon him but after that age more formal instruction should be given.

The Industrial-Arts Section meetings on Thursday were well received. A movement to establish more handicraft work in the Des Moines public schools, especially in the lower grades, was discussed by Mrs. Bernice Setzer, Assistant Director of Art in Des Moines. She pointed out that the greatest difficulty encountered in a handicraft program was the training of teachers already employed.

Lloyd L. Waite of the Department of Industrial Arts and Crafts, Cranbrook School, Bloomfield Hills, Mich., spoke on industrial-arts education today in the intermediate school.

A third speaker on the program was Elmer W. Christy, Director of Industrial Arts, Cincinnati, Ohio. His topic was "Industrial Arts in the Senior High School." He cited that only a few years ago "The manual-training program was so fixed, so limited, and so thoroughly analyzed and systematically presented that few thought to question its objectives or content. He further stated that new education theories rose above the horizon, formal discipline was largely discredited, education instead of being stressed as preparation for adult life, was conceived to be life itself with normal growth and experience at each level contributing to the development of understanding and appreciation which would serve to solve adult problems when they are met."

Several very significant subjects were discussed at the Catholic-Art Section. Among them were: "Standards for Evaluating Catholic Arts Education Today"; "An Art Teacher's Evaluation of the Art Education"; "An Evaluation of Normal Training in Art Education"; "An Artist's Evaluation of the Art Education"; and "An Art Student's Evaluation of Art Education."

The local committees of Grand Rapids had planned a series of visits to museums and industries and these proved to be of exceptional interest to the members present. One group went to a wood carving-studio where a brief talk by Alois Lang, wood carver, a member of the famous Oberammergau Lang family gave some demonstrations. There were group meetings on ceramics, photography, painting, mural painting, soap carving, and book designing. There also were trips to furniture factories, furniture designing studio, and a rug exhibit, all of which proved to be of much interest to the group attending.

At the dinner dance, Association members were entertained by a group of musical lumberjacks, no one in the group under 75 years of age.

—*Harry E. Wood.*

♦ The Connecticut Industrial Arts Association, at its annual spring conference held April 14 and 15 at the Teachers College of Connecticut, honored Mr. Frank J. Preston, industrial-arts instructor in the Hartford Public High School for the past 42 years. Dr. Alonzo G. Grace, Commissioner of Education sent greetings and Dr. Herbert D. Welte, President of the Teachers College of Connecticut welcomed the men of the Association. Mr. Karl Reiche, superintendent of schools of Bristol and a former student of Mr. Preston, spoke on the subject, "My Teacher." Mr. Phipps of the Teachers College spoke on "Things I Have Learned From an Outstanding Student and Fellow Teacher." Mr. Fred Wish, superintendent of Hartford, sent his expression of gratitude for Mr. Preston's valuable services. Other speakers were: Mr. Walter F. McAndrews, supervisor of industrial arts in Hartford and Mr. Clement C. Hyde, former principal of the Hartford Public High School.

Mr. John Cave of New Haven acted as toastmaster for the dinner program and Mr. Frank Whitman, President, presented Mr. Preston with a testimonial from the Association.

Dr. Herbert D. Welte spoke at the Saturday morning meeting on "Educational Opportunities for Connecticut Youth." He was followed by Mr. Richard Johnson of New York University who talked on "Trends in Industrial Arts."

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Starrett Tools are priced to give maximum value and usefulness for what the average budget can afford.

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(Continued from page 18A)

Round-table discussions were conducted by the following: Fred Martin, woodworking; John Dillon, drawing; Earl Flagg, graphic arts; Herbert C. Phelan, automotives; Frank Luddington, general metals; Louis R. Cecil, general shop; Dr. S. Willard Price, teacher education; Dr. Paul N. Wenger, elementary industrial arts; Worcester Warren, "Superintendents' Overview"; and Harry Barnicle, "Safety Education."

The officers elected for 1939–40 were: President, Eugene Giammatteo, Bristol; Vice-presidents, Hosmer C. Jones of West Hartford, Dr. Paul N. Wenger of Greenwich; Secretary, John A. Whitesel, Teachers College of Connecticut, New Britain; and Treasurer, John H. Iles, Bristol. — *John A. Whitesel.*

♦ Over 500 teachers and administrators attended the annual Industrial-Arts Conference held April 26 at the State Teachers College, Trenton, N. J. The shops were opened at 4 o'clock for the exhibits and demonstration. A dinner meeting at the College Inn at six o'clock was followed at eight o'clock by a series of four panel discussions. The subjects under discussion were: (1) "Subject Matter Content of Mechanical Drawing," (2) "Methods of Teaching Related Information," (3)"Recent Trends in Industrial Arts," (4) "Crafts for Informal Groups."

Another feature of the conference was the printing and distribution of a booklet of seventy-five projects and processes. For each process in the booklet a demonstration was held for those teachers interested and all projects shown in the booklet were displayed. These booklets were sold to attending teachers at the price of the paper and cover material used.

A Hobby Exhibit was held in a separate room. The exhibit contained craftwork done in some twenty clubs outside the college conducted by students from the department. — *James J. Crawford.*

♦ The eighth annual banquet of the Westchester Industrial-Arts Club was held at the Rye High School, Rye, N. Y., on June 3.

The entertainment of the evening was "Dr. Doolittle's Old Time Medicine Show" put on by a cast made up of club members. This was followed by the usual vaudeville skits which proved to be unusual and highly entertaining.

The Westchester Industrial-Arts Club has grown from its original 30 charter members to an organization of 101 members. It is one of the 26 clubs in the State of New York that have been organized for the promotion of better industrial-arts education in the schools of the state. Mr. Roy G. Fales, State Supervisor of Industrial Arts, is an honorary club member.

Members of the Westchester Industrial-Arts Club

The following officers for 1939–40 were installed as part of the dinner program: President, Harry W. Clark, Chappaqua High School, Chappaqua, N. Y.: Vice-President, Charles Leffert, Yonkers, N. Y.; Secretary, Paul Ansel, Mamaroneck, N. Y.; Treasurer, William Duke, Ardsley, N. Y.

The retiring officers are: President, George Cordon, Jr., Rye High School, Rye, N. Y.; Vice-President, Fred Farr, Mamaroneck, N. Y.; Secretary, Frederick V. Peters, New Rochelle, N. Y.; Treasurer, George W. Hermance, White Plains, N. Y. — *Emerson Wm. Manzer.*

♦ The Sixth annual State-Wide Industrial Education Contest was held at the Clemson A & M College of South Carolina on April 14 and 15 of this year. All high schools teaching drawing, woodworking, or textiles were invited to send teams to compete for awards in judging woodwork projects, woodworking skill; judging drawing projects, drawing skill; judging textile cloth, and textile skills. About 150 high-school boys participated during this meet. In the six years that the contest has been sponsored by the industrial education department of Clemson College, industrial work in the State of South Carolina has more than doubled. Anyone out of the state who is interested in receiving a copy of the rules and regulations for these annual contests may receive one by writing to H. S. State, Head of the Department of Industrial Education, Clemson College, S. C.— *H. S. Tate.*

♦ The annual spring meeting of the Fairfield County Industrial Arts Association was held May 18th at the Bassick Senior High School, Bridgeport.

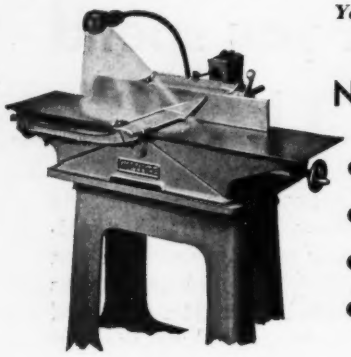
Among the guests of the association were: Mr. Worcester Warren, Superintendent of Schools, Bridgeport, and Mr. George Gordon of Rye, N. Y. An election of officers was held, and as a

(Continued on page 20A)

LOOKING FOR ECONOMIES?

You'll find them in the

WALLACE No. 10 JOINTER



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Thrifty buyers know the economy of the Wallace No. 10 Jointer. It is a man's tool, for teaching woodworking in a man's business world, — not a toy-shop machine.

Power to spare for your heaviest jobs. And ample capacity, with the four 8″ knives set askew to take a whittling cut. Work turned out on the Wallace No. 10 model is mirror-smooth,—you'll be surprised at the difference!

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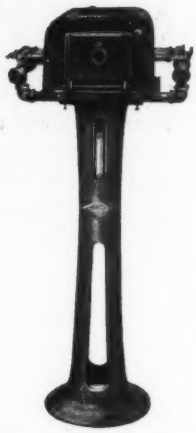
140 S. California Ave. Chicago, Illinois

Get Faster Heat Treating at Lower Operating Cost with a Johnson 650

Here's a p-o-w-e-r-f-u-l six burner furnace with patented Johnson Direct Jets that develop 1800 degrees F. in the firebox with any type gas. Each burner has independent shut-off valve and pilot light, and will heat-treat any carbon steels up to its capacity. Ordinary carbon steels may be subjected to direct flame as there is no oxidation. Its simple, rugged construction gives highest efficiency and lowest possible operation cost without the need of blowers or forced air blast. Write now for your FREE catalogue of the Johnson Line. Prices are surprisingly low!



Note the 650's simple, trouble-free design and compact build. Finest materials throughout!

JOHNSON GAS APPLIANCE CO. Cedar Rapids IOWA

(Continued from page 19A)

tribute to their excellent work of the past year, the entire slate was re-elected to serve another year.

Dr. Paul N. Wenger, President of the association, turned the meeting over to Mr. Frank Whitman of Bridgeport for the main event of the evening.

Mr. Whitman presented Mr. Shaw, Engineer at the local plant of the General Electric Co., who then gave a telecast of a variety show from New York. Although Bridgeport is out of the range of perfect reception, still an excellent telecast was obtained. Much has been heard of television, but very few of the members had had an opportunity of actually seeing a telecast.

Following the telecast, Mr. Shaw, with the aid of numerous charts and devices, explained the principle of television and the technical details. He also spoke of the many problems which still faced television, but throughout his talk he maintained that only a short time would be necessary to solve the problems which withhold the possibility of television for all in every part of the country.

Following Mr. Shaw's talk, Mr. Feurestein of Stamford presented movies of activities in his shop. These movies are a basis for a record of industrial-arts work throughout the New England States. — *Edward P. Stach.*

♦ Problems of the industrial-arts teacher and supervisor will again be discussed at a Four-State Regional Conference to be held at Kansas State Teachers College, Pittsburgh, Kans., October 6 and 7, 1939.

The first of these conferences was held last year for teachers and supervisors of industrial arts for the states of Kansas, Missouri, Oklahoma, and Arkansas. It aroused so much interest and enthusiasm that its repetition was unanimously voted for. It will be preceded by a Conference of Evening School Directors to be held at the same place on October 5, 1939.

Buyers News

VISITORS to the New York World's Fair, when viewing the section where 21 model homes are open for inspection, will be interested in the Stanley home workshop on the first floor of Model Home No. 15.

The space allotted for the home workshop is small, yet a compact, ideal homecraftsmen's workshop has been arranged. Equipped with Stanley hand tools and Stanley electric tools, it shows an assortment of tools that would gladden the heart of any woodworking hobbyist.

AFTER YEARS of experimenting with various types of protective coverings for shipping heavy rolls of sandpaper, the Behr-Manning Corp., Division of Norton Co., Troy, N. Y., have patented a very simply made pad which does away with all of the complaints previously heard about damage to sandpaper in transit.

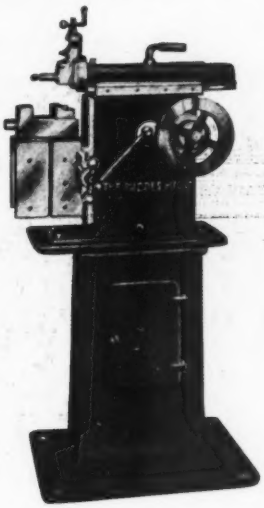
This ingenious bump-proof shipping pad is made by winding up a long width of corrugated board, sprayed with an adhesive, and afterwards sawing it into disks desirably compressible, and also resistant enough to keep the edge of a heavy sandpaper roll from injuries due to the impact experienced when dropped off a truck or box car. As many as eight freight handlings en route have

(Continued on page 22A)

Stanley home workshop

RHODES 7" SHAPER

RHODES SHAPERS SLOTTERS RMCo



A precision Shaper that is widely used for educational purposes. Easily converted into 3½" Slotter, making two machines in one. Available with countershaft drive, or with motor drive, using ½ H. P. motor, thus making a self-contained unit. Occupies small space. Priced low. Send for bulletin.

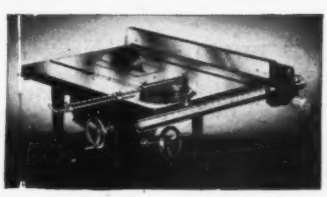
THE RHODES MFG. CO.
WALTHAM, MASS.

DESIGNED and BUILT *SAFE* with GREATER CAPACITY

New! "HELMET HEAD" DRILL

BOICE CRANE

Sealed against hazards common in other presses, but all advantages and economy of V-belt drive. ***Durable, accurate, smooth running, quiet, big in capacity*** beyond any low priced drilling, mortising, routing machine yet offered.



New! **TILTING-ARBOR SAW**
Again in 1939 Boice-Crane offers the best in Tilt-Arbor saws. Brand new is the sensational Rip Fence with *single* control handle performing THREE distinct functions. Speeds fence setting! Easier! Improves work! Boice-Crane Rolling Pulley Drive still outperforms others and saves you cost and upkeep.

BOICE-CRANE CO., Dept. 999, Toledo, Ohio
Indicate which FREE Books you want
☐ 1939 Catalog of fine Power Tools
☐ Metal Spinning Instruction Book
Name
No.
City State

SEND FOR FREE 1939 CATALOG

Shows Saws, Jointers, Lathes, Jig-Band Saws, Planer, Shaper, Sanders, Spinning Tools.

- Lighter in weight, much easier to use!
- Patented lever makes belt changing fast and easy!
- Safety switch prevents accidental starting!
- Belt speed of 1200 surface ft. per minute.

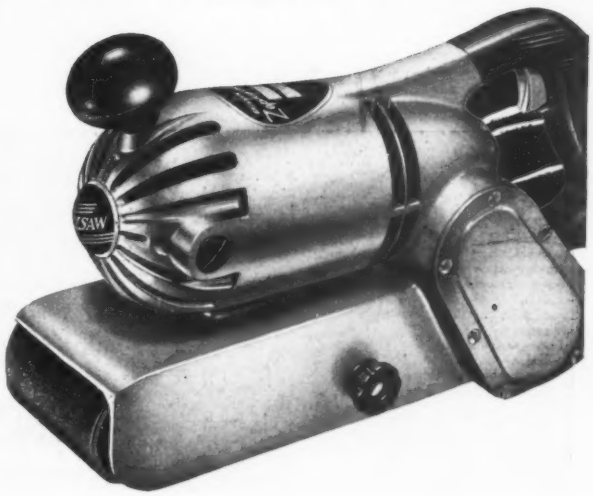
IT'S FUN TO SAND

with the

New! SKILSAW *Zephyrplane*
THE MODERN 3 INCH BELT SANDER

Students enjoy using the modern streamlined "ZEPHYRPLANE" because it's lighter, perfectly balanced. Speeds up project work . . . produces a better finish with much less effort. Simple — plugs into light socket. Also used for resurfacing blackboards, desks, wood trim, stair treads.

SKILSAW, INC., 5035A ELSTON AVE., CHICAGO



Send for Price List No. 40

THE McCORMICK-MATHERS PUBLISHING COMPANY

WICHITA . KANSAS

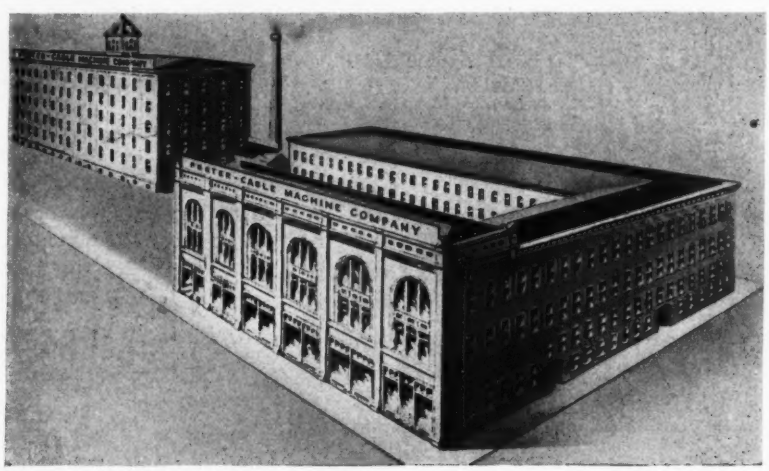
ATLANTA • 118 Spring St. N. W. • COLUMBUS • PORTLAND • NEW YORK 250 Park Ave.

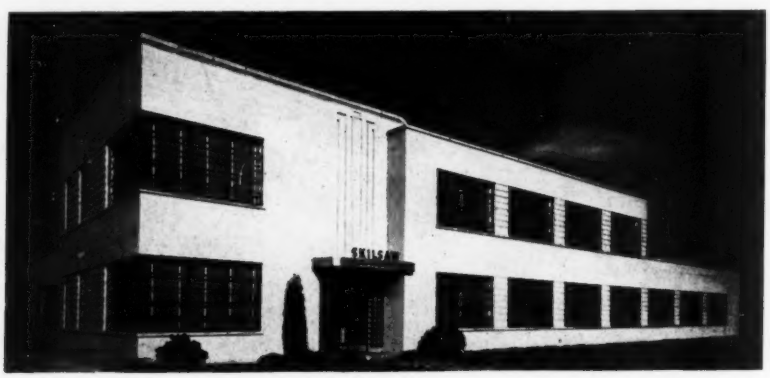
(Continued from page 20A)

proved the efficiency of the pads to protect the edges of the roll. For a 35-pound roll, pads an inch thick are sufficient; on the heaviest roll, an inch and a half pad will absorb the impact when it is dropped on a concrete floor.

THE NEW DAYLIGHT PLANT which Skilsaw, Inc., will occupy early this year, will represent an increase of two and one-half times the space previously occupied by Skilsaw but more than quadruple its capacity. Departmentalization of production, storage, and handling facilities in an efficient, logical layout has been applied to take maximum advantage of daylight. Unusual modern features are incorporated in the new plant by the use of color and special treatment of brick and glass block in the exterior. The two-story office section extends across most of the 140-ft. landscaped façade, and the plant proper has an over-all depth of 200 ft., with an additional 300 ft. available for future expansion.

PORTER-CABLE MACHINE CO. of Syracuse, N. Y., manufacturers of portable and stationary sanding and sawing machines, have added 90,000 square feet to its present manufacturing facilities. Expansion into this new area will take place at once as present sales have outgrown capacity of former property.



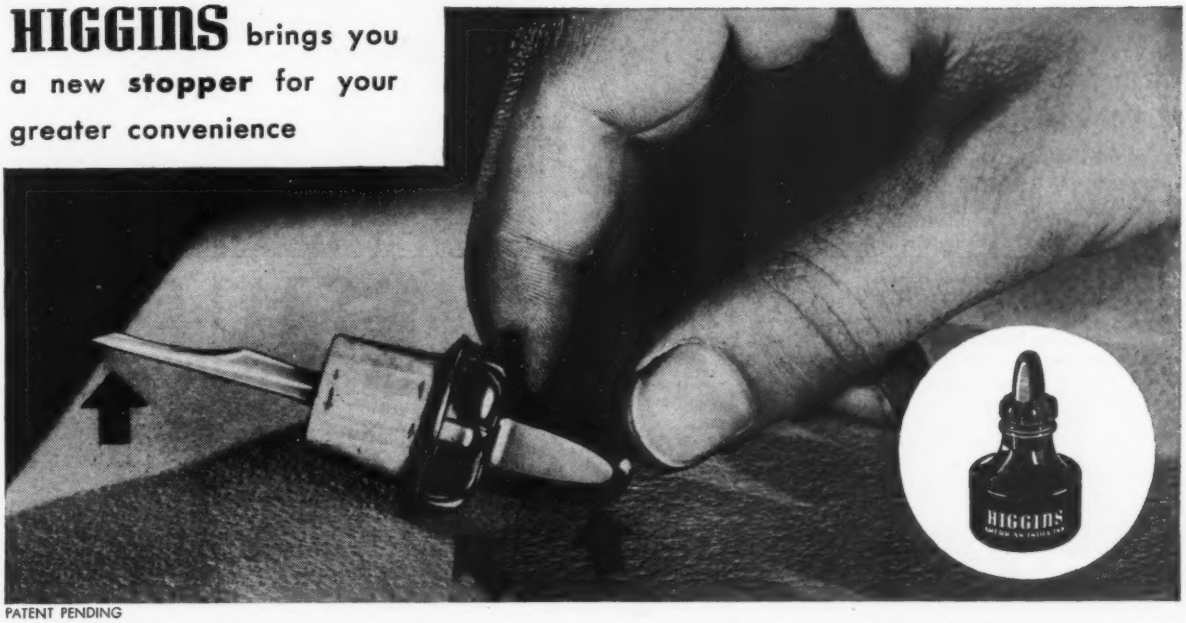


As is well known, this firm manufactures a large line of electric floor-sanding machines, portable electric handsaws, and other sanding, cutting, and grinding equipment.

THE WORKSHOP LAYOUT CONTEST featured by the Delta Mfg. Co., 600 E. Vienna Ave., Milwaukee, Wis., which closed May 15, 1939, produced a number of excellent layouts.

The judges, consisting of: Carl A. Carlson, Superintendent of Shops, Lane Technical High School, Chicago, Ill.; H. W. Schmidt, Supervisor of School Building Service, Dept. of Public Instruction, Madison, Wis.; Roy A. Radtke, Supervisor of Industrial Arts, Milwaukee Public Schools, Milwaukee, Wis.; Roy R. Van Duzee, Supervisor of Industrial Arts, West Allis Public

HIGGINS brings you a new **stopper** for your greater convenience



PATENT PENDING

This improved quill stopper has been adopted for the famous Higgins Drawing Ink desk bottle to add to its convenience and safety. Its several new features are as follows:

1 Shoulder ridges make stopper easy to grip for turning to remove from bottle neck and prevent rolling when stopper is placed on a sloping drawing table.

2 Stopper is weighted so it always rests with point of quill up.

3 Flat side on steeple provides a thumb rest which is so arranged that open face of quill is always uppermost when thumb is placed upon it, thus guarding against spilling.

4 Quills are genuine feather quills which will not splinter or break and are just right to take up enough ink for one filling of ruling pen.

5 Large cork makes possible bottle neck wide enough to admit freely lettering pen or brush.

New stoppers and empty bottles may be purchased from your Artists Supplies Store or Stationer

CHAS. M. HIGGINS & CO., INC. • 271 NINTH ST., BROOKLYN, N. Y.

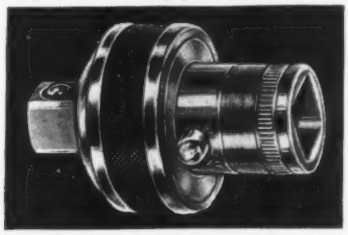
Schools, West Allis, Wis.; and Herbert Tautz, President, Delta Mfg. Co., had no easy job in picking the winners.

The following are the names of the prize winners: Woodworking Shop — First place, Albert H. Barlow, Pemetic High School, Southwest Harbor, Me.; Second place, L. B. Beres, George Washington High School, Alexandria, Va.; Third place, A. Peter Willis, St. Albans School, Washington, D. C.; Next five places, Oscar Sontag and Leo Jung, E. W. Backus Jr. High School, International Falls, Minn.; Paul Goodwin, Hand School, Madison, Conn.; David C. Knight, Gibbstown Public Schools, Gibbstown, N. J.; Harry W. Cameron, Senior High School, Appleton, Wis.; and Louis H. Frolich, Jr., E. G. Hewitt Public School, Ringwood Manor, N. J. General Shop — First place, Orville Earheart, Enochs Jr. High School, Jackson, Miss.; Second place, Edward F. Thomas, Mechanicsburg Jr. and Sr. High School, Mechanicsburg, Pa.; Third place, Charles E. Clark, C. K. Burns School, Saco, Me.; Next five places, D. H. James, Bishop High School, Bishop, Calif.; K. G. Wise, Union-Scioto School, Chillicothe, Ohio; D. M. Burkhiser, Storm Lake High School, Storm Lake, Iowa; Oscar Lindstrom, Hutchinson High School, Hutchinson, Minn.; and R. C. Ferguson, Midland High School, Midland, Texas.

New Products

Ratcheting Adapter for ½-In. Drive Handles

For years mechanics have struggled with ordinary ratchet wrenches and other types of handle equipment to service nuts and bolts in recesses and in close-up places where such operations were extremely awkward. Now comes this newly developed addition to the socket-wrench field which simplifies all these time-taking jobs. It is a unit that can be used in combination with any standard ½-in. square drive handle. Placed in the hookup between the handle and the socket wrench it converts the handle into an efficient, speedy ratchet-type tool. A convenient thumb button instantly reverses the ratchet action. There is hardly a nut-turning job on which this new

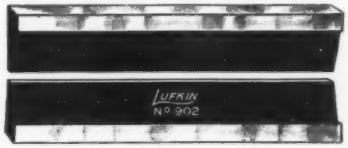


unit will not afford greater working convenience and additional wrench speed.

For further information write Snap-on Tools Corporation, Kenosha, Wis.

Lufkin Hold Downs

The Lufkin Rule Co., Saginaw, Mich., have just added a series of hold downs to the Lufkin line of machinist's precision tools. They are used where other methods of clamping are inconvenient and are especially handy for holding thin work.

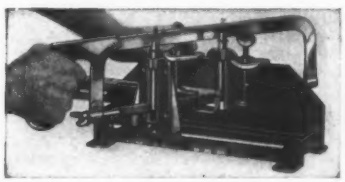


The new Lufkin hold downs not only clamp the work most securely, but constantly force it downward against the supporting surface, because both contact edges are properly tapered and there is a clearance step along the entire length of the front of the underside.

They are of steel, hardened and ground, and are made in five lengths, 2, 3, 4, 5, and 6 inches. All are of the same width and thickness, so any of the lengths can be used together on long work. They are sold in pairs and are known as Nos. 902 A, B, C, D, and E.

New Metal-Cutting Miter Box

A new Metal-Cutting Miter Box for installers of metal moldings and trim has just been announced by Stanley Tools, New Britain, Conn. Its capacity is 2¼ in. high x 3 in. wide.



This miter box will cut aluminum, white metal, monel metal, brass, bronze, steel, stainless steel, wood, plastics or any material that can be cut with a hack saw. It is light in weight and can be carried to the job where most of the cutting is done.

The box is all steel and has durable cast-iron saw guides reinforced with steel. The saw-guide posts are a new "snap-on" type which are ground to fit into the saw guides. The "snap-on" feature permits removing the saw-guide posts so that the hack saw can be used independently of the box.

A hack-saw frame with a 12 in. — 32 tooth quality steel saw is furnished with the box. Angles of 90 deg. and less, right or left, can be cut. A sliding-front guide securely held in position by a clamp bolt and wing nut is used to obtain the different angles. The degree scale is accurately and clearly marked.

(Continued on page 24A)

Your School Deserves What KEWAUNEE Furniture Gives!

With increased enrollment, larger classes and heavier teaching duties, schools that install Kewaunee Furniture find both students and instructors doing better work. With this finer furniture you get—

Every convenience
Every helpful feature
Design that makes class work easier—
Class management easier for the instructor.

No wonder better schools everywhere are turning to Kewaunee for the most satisfactory and economical solution of their Furniture problems.

Single Manual Training Bench No. N-3088

Write today for the Kewaunee Blue Book of Vocational and Laboratory Furniture. No charge to buyers.

Metal Worker's Table No. N-3151

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Kewaunee Mfg. Co.
LABORATORY FURNITURE EXPERTS

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245 Lincoln St., Kewaunee, Wis.
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FASHIONS SINCE THEIR DEBUT

by CARRIE WILSON
Fashion Artist and Designer, New York City

A history of costume from the earliest time presented through the medium of 28 plates, each showing the silhouette of the period, the details of the costume, and the accessories fashionable during that period. An indispensable volume for all students of costume design.

72 pages, 8½ x 11, cloth, $1.50

Send for an examination copy on approval

International Textbook Company
Scranton, Pennsylvania

(Continued from page 23A)

In order to accurately cut various shapes of molding, it is necessary to support the molding with wood filler blocks. Two wood filler blocks which are furnished with the box will support a number of common shapes of molding and trim. Adjustable thumbscrew clamps on each side of the box hold work tightly.

New 3-In. Belt Sander

A new streamlined 3-in. belt sander has just been announced by Skilsaw, Inc., Chicago. It is called the Skilsaw "Zephyrplane" and has been

developed particularly for those whose work does not justify the purchase of the usual larger and more expensive sanders. It is well suited for industrial-arts shops for school maintenance work.

The new sander is a perfectly balanced tool that provides uniform pressure over the entire sanding surface. It is light in weight and is easy to handle. A novel feature is the interchangable knob handle that can be moved from the top to the nose of the sander for greater convenience in sanding vertical surfaces, such as sides of cabinets, boats, and blackboards. Another outstanding feature is the patented "touch-control" lever that instantly releases the tension on the sanding belt, so that changing belts becomes a very simple and quick operation. An important safety feature is the pressure-control trigger switch which makes accidental starting impossible. Smooth running is assured by ball bearings on armature and transverse shaft, and oilite bearings on idler and driver pulley. A belt speed of 1200 sur. ft. per minute permits fast sanding and produces a smooth, even surface without ripples or ridges.

Rapid Electroplater

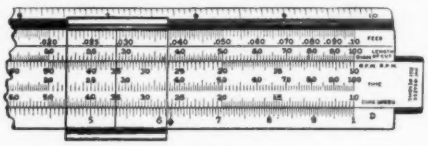
An astoundingly simple, small but practical, portable electroplating kit has been developed by the Burgess Handicraft and Hobby Service, 117 North Wabash Ave., Chicago, Ill.

By means of this equipment, real electroplating may be brushed on, so that anyone, without previous experience, can do commercial plating on individual articles or on specific areas without dismantling the entire object.

Only one 1½-volt dry battery is needed for plating with nickel, while two 1½-volt dry batteries will suffice for plating with other metals. Cadmium, nickel, copper, brass, zinc, silver, and gold have been successfully used, and the plating compounds, which are of a jellylike consistence, are easily and safely handled.

Langsner Industrial Slide Rule

The Langsner Industrial Slide Rule, manufactured by the Eugene Dietzgen Co., Chicago, Ill.,

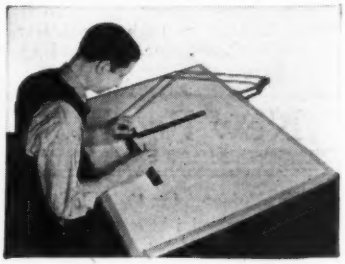


is designed to solve an unusual range of industrial problems, with only one movement or setting of the slide in the majority of cases. This rule combines many in one, although there is only one slide. The face has six scales: Two of them represent feed, length of cut, and diameter; three of them represent r.p.m., time, and cutting speed; and the regular *D* scale. The reverse side of the slide contains the usual *B*, *CI*, and *C* scales, for standard slide-rule calculations. Three of the face scales are numbered in red, the remaining three in black, for convenience in use. The table on the back presents familiar constants.

The Langsner Rule was developed to the practical requirements of mechanical engineers, industrial engineers, shopmen, time-study experts, and machine designers. It is 10 in. long, engine divided on white celluloid, with glass "frameless" indicator, and is accompanied by a book of instructions.

Reliance Drafting Machine

A new sturdy, fast, accurate and low-priced drafting machine is announced by Eugene Dietzgen Co., Chicago, Ill. The Dietzgen reliance drafting machine brings the convenience, accuracy,



and speed of drafting-by-machine to drafting boards, taking drawings up to 23 by 28 in., where the volume or type of work does not justify the investment in the larger and costlier units.

(Continued on page 27A)

Ozalid

Invites you to a demonstration of the

New Elpro Portable Printer

Booth 11
Metals Bldg., World's Fair

See this new low-priced, positive-printing dry-developing reproduction equipment.

"A Print Room in a Portable Case"

◆

Distributed by

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"How to ESTIMATE for the Building Trades"

This new 630 page book just came from the press. Most complete and practical book on the estimating of materials and labor for *every* phase of the building trades—nothing is omitted. Contains 8 *full sized* blueprints drawn to standard scale, regulation estimating forms, specifications and contracts, over 500 questions with answers. Everyone at all interested in the building trades should have this new book!

We will be glad to send a copy for 30 days *on approval* inspection, subject to our educational discount if retained. This offer also applies to any of the new books listed below.

Steel Square	$1.25
Painting and Decorating	1.50
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AMERICAN TECHNICAL SOCIETY
Drexel Ave., at 58th St., Chicago, Dept. HS—72
Please send the following texts for 30 days ON APPROVAL examination. I will either return them at the end of that time or remit less your educational discount.

Name _____

School _____

School Address _____

(Continued from page 24A)

Throughout, the Reliance drafting machine is well built and sturdy. It embodies conveniences and features ordinarily seen only in more expensive machines. It embodies new lightweight and strong anchor construction, and new adjustment features which compensate for natural wear and greatly increases useful life. Protractor and knob are constructed in one integral unit, and the protractor turns through 360 degrees, and there is an easy thumb control of protractor through a new angle lock. The scale chuck plates take any standard scales.

Lufkin Automatic Center Punch

The Lufkin Rule Co., Saginaw, Mich., have just added the new No. 1671A, automatic center punch with adjustable stroke to their line of machinist's tools.

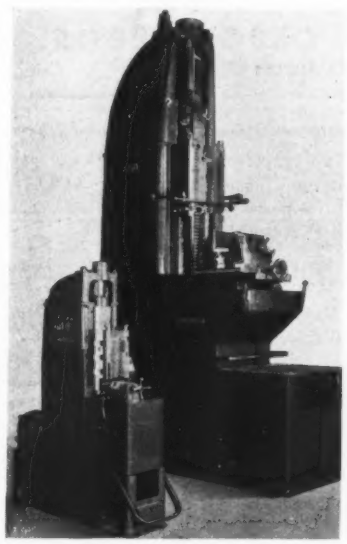
A punch of this type is almost indispensable on fine work, and it is handy for all kinds of marking. It assures accuracy and speed, for with it only one hand is employed, a hammer being entirely unnecessary. Thus it can be most precisely placed, and slipping and the many other chances of error in the hammer method, are avoided.

This center punch has a simple mechanism which, when the tool is held upright on the work with a downward pressure, automatically, at the will of the mechanic, strikes the blow. As necessary for different materials, the force of this blow is regulated by screwing the knurled cap. In this, No. 1671A offers a wide range of adjustment. Set for medium stroke, the length of this punch is 5 in. Its body is knurled and grooved to give most positive grip. All working parts are properly hardened. Point is easily removed, ground, and replaced.

Single-Ram Vertical Hydro-Broach Machines

A new line of Cincinnati Single-Ram Vertical Hydro-Broach machines have been announced by The Cincinnati Milling Machine Co., Cincinnati, Ohio.

Built in twelve standard sizes, from the No. 1–18 with an 18-in. ram stroke and 2,000 pounds normal broaching force to the No. 15–60 with a



60-in. ram stroke and 30,000 pounds broaching force, the Single-Ram Hydro-Broach machines are obtainable in both the fixed and the receding table types.

The standard fixed table machines are built for single-cycle operation and the ram stops at the end of each stroke. Completed work is removed at the end of the cutting stroke and new work is placed in the fixture while the ram is stopped at the top of its return stroke.

Either full automatic or single-cycle operation may be arranged with the receding table-type machine. Work is loaded, in the full automatic cycle, as the ram returns to the starting position following the completion of the cutting stroke. The table advances to the broaching position, the ram makes a cutting stroke, the table recedes and the cycle repeats itself.

For single-cycle operation of the receding table-type machine, the ram is stopped at the top of the return stroke and the operator unloads and loads the work.

Both types of machines, regardless of the operating cycle, may be stopped instantly by shifting the hand levers at each side of the operating station or by stepping on the foot treadle. Instant reversal by means of the dual hand levers is also provided. Both features are aids during setup operations.

New Hack Saw Blades

Two new Nos. 400 and 500 hack saw blades have just been announced by E. C. Atkins and Co., 402 South Illinois St., Indianapolis, Ind.

The shape of the teeth have been so designed

that they produce coiled shavings which are freely ejected from the gullet. Besides this, the teeth are so formed that they will stand up under heavier feeds and speeds. The method of setting the teeth for clearance is an exclusive Atkins patented feature which permits the points to cut

(Continued on page 29A)

THE MARKET PLACE

ARMSTRONG
Tool Holders

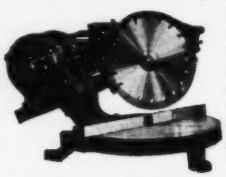
The ARMSTRONG System provides permanent multi-purpose tool holders for every operation on lathes, planers, slotters and shapers. Each takes cutters quickly ground from standard high speed steel shapes. Each effectively equals a complete set of forged tools and "Saves All Forging, 70% Grinding and 90% High Speed Steel."

Write for free Cutter Bit Grinding Charts

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
322 N. Francisco Ave. Chicago, U.S.A.

TANNEWITZ TYPE M
ELECTRIC MITRE SAW

Precision Tool of Thousand Uses



Instantly swivels and cuts any angle from 45° R. to 45° L. Made in two sizes for bench use. Employed in thousands of factories, schools, stores, etc.

Write for circular.

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REAL Quality Tools

Products of SpeedWay, leading manufacturers of electric tools for industry, these new drills are correctly designed, operate at most efficient speeds, and embody the features, power and capacity of much heavier and more costly tools. **1000** RPM **DRILL** powered by genuine high torque SpeedWay Drill motor has die cast handle and gear case. $7.95. 20,000 RPM HAND GRINDER, new far more efficient design. $5.95. SpeedWay No. 250 Kit—Drill, Grinder and 5 accessories in steel carrying case $14.95. Also complete line of cutters, stones, etc., and stand to convert into lever fed Drill Press or Precision grinder. Ask your dealer or write direct for circular.

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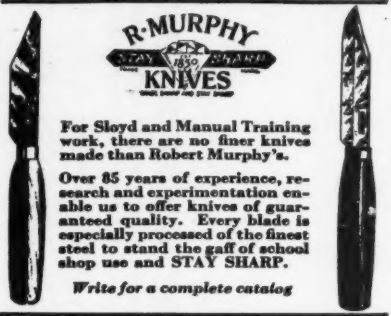

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Over 85 years of experience, research and experimentation enable us to offer knives of guaranteed quality. Every blade is especially processed of the finest steel to stand the gaff of school shop use and STAY SHARP.

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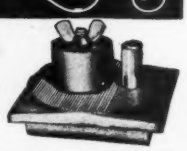
MASTER METAL BENDING TOOL



Makes Scrolls, Circles, Curves

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For metal bending and wire forming. Accommodates metal up to 1 inch wide by ⅛ thick. Accurately adjustable by 1/16 inch. Widely used in school and craft shops. Obtainable at Hardware and Craft Supply Houses. Directions with each tool.

Send for folder describing 25 Metal Projects and available Blue Prints.

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STEERLING STEEL FLASKS

Made of Specially Rolled Copper Bearing Rust-Resisting Steel Channel sections having a solid center Rib and Solid Sand Flanges at Top and Bottom.

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SAFE FOOL-PROOF

Sta-Warm Electric Glue pots (½-8 qts.) quickly heat glue to proper 145-150°, with automatic thermostatic control to hold it there . . . No burned spoiled glue—no water jacket troubles—no fire hazards. Teach your students the modern, safe, fool-proof methods used in all modern factories.

STA-WARM ELECTRIC CO.
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Represented by **Oliver Mach. Co.** Grand Rapids, Mich.

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WEIGHS ONLY 10 LBS.

Here's a handy, efficient lathe grinder, developing 30,000 r.p.m. for internal work, 6,900 r.p.m. for external work, powered by a 1/5 h. p. Dumore motor—yet compact enough to mount on small South Bend lathes, or bench lathes. It's the popular Dumore "Spee-Dee"—portable, quickly set up, ideal for classroom work. Write today for information.

THE DUMORE CO.
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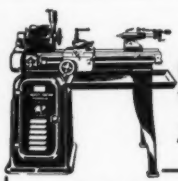

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Safety Underdrive

Back Geared, Screw Cutting
PRECISION LATHES

For schools no lathe equals a Sheldon 4-speed Type "U" Underneath Pedestal Drive. Full bowl headstock and cabinet leg enclose all belts and pulleys. Speed changes are made by external shift levers, and cabinet is opened only for occasional oiling.

Write for catalog showing complete line of 10, 11 and 12 inch SHELDON Precision Lathes.

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MEGOW MODELS
were founded on fifteen years experience in teaching industrial arts.

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HO-GAUGE RAILROADS

Write for full information.

Megow

Howard and Oxford Streets
Philadelphia, Pa.

(Continued from page 27A)

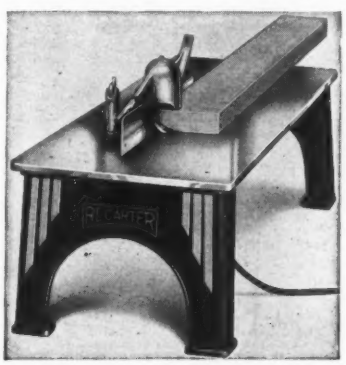
freely and without friction. The set which is obtained by a combined twist and bend, maintains square-topped teeth which make it easy to cut straight. The No. 400 saw is recommended for rounds up to 5 in. inclusive, and the No. 500 for diameters that are greater than 5 in.

New Carter Bench Shaper

The new C41 bench shaper, just brought out by the R. L. Carter Division, of The Stanley Works, New Britain, Conn., embodies a patented holder which can be tilted from vertical position to any angle up to 45 deg. upon which is mounted the 18,000 r.p.m. By tilting the motor to various degrees and by using three cutters in combinations of 2 or 3 or singly it is possible to make over 500 different cuts.

The 12 by 18 by ¾-in. shaper top is machined steel. The table stands 8⅞ in. high, allowing ample clearance for motor adjustment. Legs are of cast iron and have bolt holes in the feet for anchoring shaper to a bench.

A straight fence can be set with micro-adjustment feed screw to make a guide for jointing and edging. A safety guard, which is attached to the fence, protects the operator's hands from the cutter.



The same ⅜-h.p. motor also can be used in a router base to produce a versatile tool for routing, grooving, veining, template, and inlay work.

Locker-Type Woodworking Bench

The No. L-4 locker-type woodworking bench marketed by Brodhead-Garrett Co., Inc., Cleveland, Ohio, embodies a number of commendable engineering and design features.

The top consists of a 50 by 64-in. built-up maple surface to which are attached four Columbian vises. The top is supported on twelve steel lockers. It has sufficient overhang on all sides so that the four students who are assigned to work at it will not be hampered in their work by any obstructions beneath the bench.

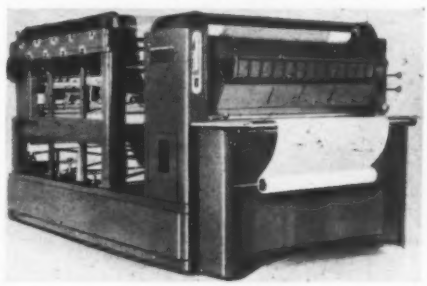
Each of the lockers are 12 by 15 by 21 in., thus furnishing ample storage space.

These locker-type benches conserve much space and meet all of the requirements of the modern school shop.

New Pease Model "22"

The new continuous blueprinting, washing, and drying machine which the C. F. Pease Co., Chicago, Ill., has just introduced, possesses speed, high-quality performance, and is of modern streamline appearance.

The new Model "22" utilizes actinic arc lamps which are controlled through a new patented switch arrangement permitting the lamps to operate at any one of three speeds as desired.



The washer is distinctly different and now comprises three horizontal water tanks upon which the paper floats as it is washed thus eliminating tension wrinkles and distortion. Nine aluminum drums are used to dry the paper evenly and absolutely flat, yet at a considerable saving in gas or electricity.

The potash and hypo application is easily and quickly interchanged by a simple lever control.

Every feature of the new Model "22" is designed to give the operator a maximum of operating facility, and a production rate of 24 linear feet per minute on d.c. or 18 linear feet per minute on a.c. for large tracings. On smaller tracings the built-in speed permits the use of slower speed blueprint paper, which means better blueprints.

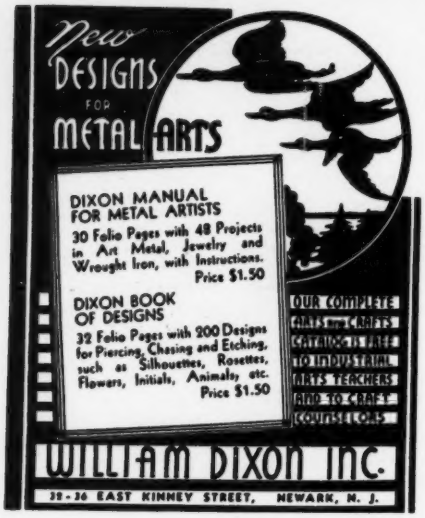
♦ Recently, the Goodyear Tire and Rubber Co., Inc., Akron, Ohio, conferred 10 grand prizes, 1 school award of $100 cash, and 25 cash prizes of $25 each to students studying vocational agriculture in high school. These prizes had been offered in a national essay contest. The subject assigned was "Farming of Tomorrow on Rubber."

♦ The Dodge Truck Division of the Chrysler Corp., Detroit, Mich., has prepared a booklet entitled "Guide for Truck Drivers" which they will mail free of charge to teachers requesting a copy.

♦ George C. Donson, Director of Industrial-Arts, High School, Washington, Pa., and his students have just finished a working model of an Eclipse Steam Traction engine which had been perfected by the Frick Mfg. Co. of Waynesboro, Pa., sometime in 1889.

The project was started in 1930 and has been built to a scale of 1½ in. equals 1 ft. About 400 students participated in making the model.

THE MARKET PLACE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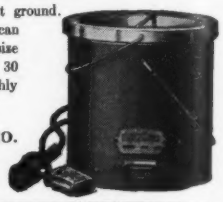
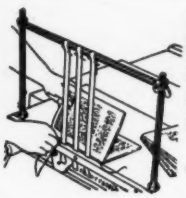


RUSSELL ELECTRIC CO.
364 West Huron Street
CHICAGO, U. S. A.



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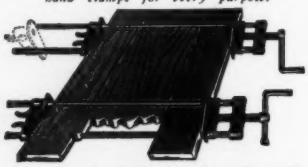

Note how the double bars keep the work from buckling.

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LEATHER SKINS TOOLS and MATERIALS

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Hossfeld Benders handle stock, cold or hot, to any angle quickly and accurately. Hossfeld Bender is a practical, indispensable tool, needed in every school shop.

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Brush Fibres, Tampico, Fibre Mixtures, Sterilized Horse Hair. Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. ***Samples matched.***

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1896 **ORIGINAL Toles Vises** 1939

18 Models for Woodwork only
2 Actions — 3 Sizes
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Standardized low fire Art Pottery Bodies, Natural Potting and Modeling Clays, burning Red, Cream, Buff, White — Available in plastic, Flour or Slip Form. Write for Bulletins 219 and 302. *Department B*

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A SELF-CONTAINED UNIT BUILT TO A STANDARD OF QUALITY. Thousands in use by Draftsmen, Students, Architects, Artists, Engineers, Designers and Executives. IDEAL FOR SCHOOL USE. Allows free use of both hands.

Made of both hard composition and NU-PLY board that stays flat. Light weight. Bar slides accurately and easily. Patented cross-strung special bronze cable and pulley mechanism give accurate action. No thumb tacks necessary. Water, oil and acid proof. Enables anyone to draw with accuracy and speed.

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Manufacturers and distributors of drawing boards and instruments.

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The Handbook of Vocational Opportunity

A unique volume by 22 men who have spent their careers in the work they analyze for young men in vocational education courses. The backbone of American Economic Life is projected against 22 major fields of occupation leading to 60 careers made accessible by a knowledge of shop work offered in secondary schools.

The authors have been selected from tool rooms, foundries, shops and offices. **They are typical of the men who will some day hire and supervise your students.**

WILL YOU LET THESE MEN HELP YOU GUIDE YOUR BOYS, TO GET THE MOST OUT OF THE OPPORTUNITIES OFFERED UNDER YOUR SUPERVISION?

Lists of books used by practical men inspire individual research—add incentive for greater application. Concise biographies of the contributors establish their right to speak authoritatively on their subjects.

"IT'S A CRACKER-JACK"—is the report of men who have used this book as supplementary reading.

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Manufacturers' PUBLICATIONS

THE NEW CATALOG No. 14, on clamps, issued by the Adjustable Clamp Co., 417 North Ashland Ave., Chicago, Ill., gives a complete résumé of the various types of clamps manufactured by this firm.

Attention is called especially to the two new items, the No. 8–S "Mark" welders' clamp with shielded screw, and the No. 61 carpenters' steel bar clamp.

It also describes the improvement made in the design of the older clamps which have so long been favorites with the craftsman.

A 58⅜ BY 21⅝-IN. CHART, entitled "Machines and Progress" is available from Continental Machines, Inc., Minneapolis, Minn.

The data for this chart was gathered and arranged by Leighton A. Wilkie, president of the aforementioned firm. In graphic form is shown the part which the machine has played in making the United States the greatest machine-producing and using country in the world.

The chart will arouse much interest when placed on the bulletin board in any shop. A nominal price will be charged for each copy.

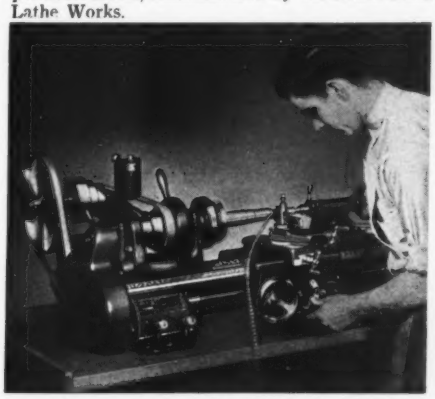
FOLLOWING on the heels of the extremely popular Post Symbol Chart, The Frederick Post Company, Box 803, Chicago, Ill., has just released another "good-will builder" to be distributed free to engineering and architectural draftsmen.

The new hit is an 8 x 1¾-in. decal that contains all the usual decimal equivalents from 1/64 to 63/64ths. Sized to fit the T square, the "decal" is easily transferred and will eliminate the usual squinting at the distant figures of a wall chart.

A request to your nearest Post dealer, or to the address given in the foregoing, will bring the desired number of these new decimal equivalent "decals." They are free to all teachers of drafting.

New Model 9-In. Workshop Lathes

Two models, A and B, have been added to the present model C of the line of 9-in. workshop precision lathes, manufactured by the South Bend Lathe Works.



All three of these workshop lathes are available in both bench type and floor type, with bed lengths of 3, 3½, 4, and 4½ ft. Several types of drive are offered, including horizontal motor drive for bench lathes, pedestal motor drive for floor-type lathes, countershaft drive, V-belt horizontal motor drive, and a 12-speed horizontal motor drive.

A new catalog giving a complete description of the three models of workshop lathes has just been published. It is available to readers of this magazine by writing to the Technical Service Dept., South Bend Lathe Works, South Bend, Ind.

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STUDENTS GO FOR IT IN A BIG WAY!

They all want to use this super tool, which is almost human in its smooth, rapid response —which does a multitude of interesting work on all kinds of metals, alloys, plastics, wood, horn, bone, glass, etc. It not only makes instruction easier on a wide variety of projects, but it's a safe tool, even for beginners.

Grinds
Drills
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Cuts
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A Power House at Your Finger Tips

It's portable. You can set up shop wherever there is an AC or DC socket, 110 volts. Uses 300 quickly interchangeable accessories. The DE LUXE Model illustrated above weighs only 12 oz. and has a speed of 25,000 r.p.m. $18.50 postpaid with 6 Accessories. STANDARD Model weighs 1 pound, 18,000 r.p.m. $10.75 postpaid with 3 Accessories.

Router-Shaper Set

Converts a De Luxe Handee into an easy-to-handle Router or Shaper that will inlay, rout, carve, make molding cuts to 100th of an inch accuracy. Three convenient fixtures and accessories, only $12.50.

Handee Work Shop

Actually 12 Machines in One

A complete and practical outfit for use with De Luxe Handee—Lathe, Drill Press, Routers, Carver, Grinder, Polisher, Sanders, Saw, Shaper Table and 10 Accessories all for $35.00 delivered.

Free 64-Page Catalog

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Kelobra	.05	Walnut-French	.04
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Mahogany-Crotch	.15	Walnut-Crotch	.15
Mahogany-Cuban	.05	Walnut-Burl	.30
Myrtle Cluster	.10	Walnut-Butt	.10
Orientalwood	.04	Zebra	.08
Species of Lumber	**Per Surface Ft.**		
Aspen	$ .15	Mahogany Crotch and Swirl	$ .30
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Kelobra	.20	Walnut	.14
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